APPENDIX A

ENGINEERING DESIGN AND COST ESTIMATE BROWARD COUNTY, FLORIDA SHORE PROTECTION PROJECT GENERAL REEVALUATION REPORT SEGMENT II

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PROJECT AUTHORITY

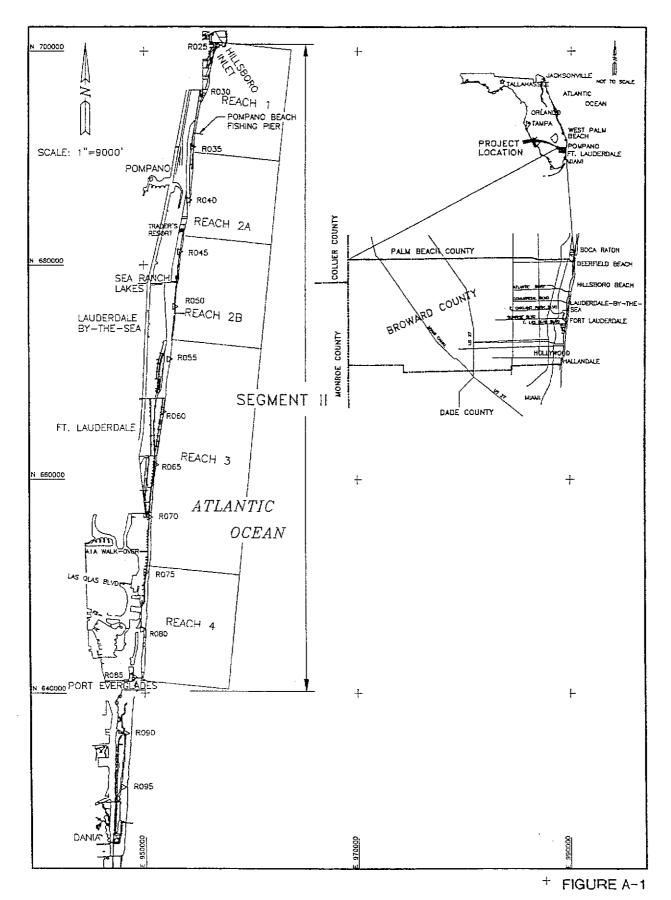
A-1. House Document 91/89/1 (USACE, 1963) describes the erosion along Broward County's shoreline. The Broward County erosion control project was authorized by the River and Harbor Act of 1965 (PL 89-298). The problem area identified between the Hillsboro Inlet to Port Everglades segment was 3.0 miles long, and had as its north limit 2,000 feet south of Hillsboro Inlet (R-31 + 650 ft.) and its south limit approximately 2,500 feet south of the Pompano Beach city limits (R-48 + 700 ft.). The original plan did not recommend restoration of the beaches south of this project area, although it recommended periodic nourishment for the remainder of the reach on an as needed basis.

PROBLEM IDENTIFICATION

A-2. The authorized project calls for a 75 to 125 foot extension of the ECL in Pompano Beach and Lauderdale-by-the-Sea. The present shoreline breaches this design width and the present nourishment interval has lapsed. While Ft. Lauderdale's beaches experience lower erosion rates than Pompano Beach and Lauderdale-by-the-Sea, the beach now requires periodic nourishment. The objectives of this appendix include quantification of existing erosion problems and the design of corrective measures. Quantification efforts involved analysis of historical shoreline positions, estimates of alongshore transport rates, predicted cross-shore processes due to storms, and equilibrium profile response. The results of these efforts constitute the basis of design of the renourishment for Pompano Beach/Lauderdale-by-the-Sea and for the extension of the project into Ft. Lauderdale.

PROJECT LOCATION

A-3. Segment II of the Broward County Shore Protection Project is located 23 miles north of Miami Beach on the southeastern coast of Florida. This segment of the Broward County Federal project consists of 11.3 miles of Atlantic Ocean shoreline from Hillsboro Inlet south to Port Everglades Inlet (Figure A-1). The segment is located on a barrier island entirely within Broward County. The municipalities within the segment include Pompano Beach, Sea Ranch Lakes, Lauderdale-by-the-Sea, and Ft. Lauderdale. For purposes of analyses presented in this appendix, the segment is subdivided into reaches (Figure A-1).



PROJECT LOCATION MAP

NATURAL FORCES

WINDS AND TIDES

- A-4. Local winds are the primary generating mechanism of short period waves in the project area. Typical prevailing winds are from the east through the southeast. During winter months (December through March), winds are often out of the northwest and north. Low pressure cold fronts generally traverse the continental United States from west to east. Severe storms associated with these fronts can cause extensive beach erosion and shorefront damage. The summer months (June to September) are characterized by tropical weather systems traveling east to west in the lower latitudes. These tropical systems can develop into tropical storms and hurricanes, which can generate devastating winds, waves and storm surge. Southeast tradewinds make up the typical summer wind climate.
- A-5. Daily onshore-offshore breezes associated with the differential heating of land and water masses are common within the study area. While these breezes play a significant role in local weather patterns, they are not an appreciable cause of sediment movement in the nearshore area.
- A-6. Tides in the project area are primarily semi-diurnal. The mean tidal range for Segment II is 2.6 feet.

NEARSHORE CURRENTS

A-7. The primary currents in the nearshore region are wave-induced longshore currents. These currents are driven by the transformation of obliquely incident waves in the surfzone. The magnitude of the longshore current is generally greatest in the region immediately landward of the point of depth-induced wave breaking, and is primarily a function of the local wind and wave climate. The longshore currents are primarily from north to south. There have been no direct measurements of wave-induced longshore currents in Segment II.

WAVES

A-8. The waves experienced in Broward County are primarily caused by local wind patterns, although some long-period swells from more distant northeast and east events are observed during winter months. The proximity of the Great Bahama Banks to the South Florida coast prevents the development of large waves from the southeast. The largest waves reaching Broward County arrive from the northeast and east. Many of these larger waves are typically generated in weather disturbances far off in the North Atlantic Ocean, while some of the northeast wave climate is caused by frontal winds. The more regular eastern wave set is generated by the daily onshore-offshore breeze discussed earlier. These shore-perpendicular waves, although frequent, are not large because of the short duration of the driving winds. The frequency of waves from the southeast (20%) is largely caused by the summer prevailing tradewinds. These winds are the primary driving force behind the northward littoral drift thought to occur during the summer months. The remaining waves recorded at Broward County are predominantly the result of frontal activity.

A-9. The principal forcing mechanism behind beach erosion is the dissipation of energy (and corresponding transport of sand) as waves transform in the nearshore. Wave height, period, and direction as well as the water level during storm events are the most important factors influencing the project shoreline. Since the 1980's, the U.S. Army Engineer, Waterways Experiment Station's Coastal Engineering Research Center has executed a series of wave hindcast studies for the Atlantic and Gulf Coasts of the United States. The 20-year long hindcasts used in this study represent conditions that existed between 1976 and 1995. For this investigation, hindcast results compiled in WIS Report 33 (Brooks and Brandon, 1995) were used. This updated hindcast includes wave information for both extratropical storms and tropical cyclones.

A-10. The wave statistics used for this analysis were obtained from Station A2010 (WIS Report 33) located at latitude 26.25° N and longitude 80.0° W. This station is roughly 10 miles offshore, where the waves are deep water waves. Tables A-1 to A-3 summarize the hindcast wave results for Station A2010. Table A-1 is a summary of the mean significant wave by month and year for the 20-year period. This table is useful in showing the distribution of wave height throughout the year. Table A-2 shows the largest significant wave height and period by month and year. The percent occurrence of wave height and period for all directions is shown in Table A-3.

YEARLY DEPTH LIMIT

A-11. For natural sand beaches, a useful coastal processes parameter is the yearly depth limit of the active nearshore profile. This is also referred to as the depth of closure (DOC). Beyond this depth only negligible sand movement is expected. Hallermeier (1978) has developed a procedure for estimating the depth of closure, d_c . This depth is based on the approximate extreme wave condition for nearshore significant waves, and may be calculated by:

$$d_c = 2.28 H_e - 68.5 (H_e^2/gT_e^2)$$

where:

 H_e = nearshore extreme significant wave height (in meters)

 T_e = nearshore extreme significant wave period (in seconds)

g = acceleration of gravity constant, 9.81 m/sec.²

A-12. The extreme nearshore significant wave height, H_e, is defined as the "effective" wave height, which has a 0.137% probability of occurring. This wave height is related to the deep water mean wave as follows (Dean & Dalrymple, 1996):

$$H_e = H_{mean} + 5.6\sigma$$

where σ is the standard deviation of annual wave data (in meters).

A-13. The mean wave height, from the WIS hindcast data (Table A-2), is 1.0 m and the standard deviation is 0.6 m. The nearshore extreme significant wave period used is the wave period

Table A-1
Wave Height (in meters) by Month and Year (WIS Station A2010)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1976	1.3	1.1	1	1	0.9	0.7	0.4	0.7	0.5	1.4	1.3	1.5	1
1977	1.2	1	1.1	1.5	0.9	0.4	0.5	0.9	0.6	1	1.4	1.2	1
1978	1.2	1.3	1.1	0.9	0.7	0.6	0.6	0.5	0.8	1.5	1.3	1.5	1
1979	1.7	1.3	1.4	1.4	1	8.0	0.6	0.5	1.4	0.9	1.6	1.4	1.2
1980	1.1	1.5	1.2	0.9	8.0	0.6	0.4	8.0	0.6	0.9	1.4	1.3	1
1981	1	1.7	1.5	1	0.7	0.7	0.5	8.0	0.9	1.1	1.2	1	1
1982	1	0.9	1	8.0	0.9	0.7	0.4	0.5	0.7	1.1	1.2	1.2	0.9
1983	0.9	1.5	1.2	1.1	0.9	0.6	0.5	0.5	1	1.2	1	1.4	1
1984	1.7	1.2	1.2	1	1.1	0.7	0.6	0.5	1.2	1.5	1.8	1.3	1.1
1985	1	1.4	1.1	1.1	0.6	0.5	0.5	0.7	1.4	1	1.4	1.3	1
1986	1.3	1	1.5	0.9	1.1	0.6	0.4	8.0	0.9	1.1	1.2	1.4	1
1987	1.3	1.1	1.7	0.9	0.9	0.6	0.6	0.6	0.5	1.3	1.3	1	1
1988	1.4	1.1	1	0.9	8.0	8.0	0.6	0.5	0.9	1	0.9	0.9	0.9
1989	0.9	1	1.1	0.8	0.6	0.6	0.4	0.5	8.0	1	0.7	0.9	8.0
1990	0.9	1.3	1.2	1.1	8.0	0.6	0.6	0.4	0.7	1	1.1	1.1	0.9
1991	0.9	1	1	1	0.9	0.6	0.4	0.5	0.6	1.1	1.1	1	0.9
1992	1	0.9	0.9	1	8.0	0.6	0.6	0.6	0.7	1	1.4	1.1	0.9
1993	1.3	1.2	1.3	1.1	1	0.7	0.4	0.6	0.7	8.0	1.3	1.1	1
1994	1.4	1.2	1	1.1	8.0	0.6	0.7	0.7	8.0	1	1.3	1.3	1
1995	1	1	1.3	0.9	0.8	0.7	0.6	1	0.9	1.3	1.1	1.1	1
MEAN	1.2	1.2	1.2	1	0.8	0.6	0.5	0.6	0.8	1.1	1.3	1.2	

Table A-2

Largest Wave Height (in meters) by Month and Year (WIS station A2010)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1976	3.9	3.6	3.7	2.7	3.1	1.2	0.8	2.1	0.9	3.7	3.2	3.9
1977	2.5	2.3	3.4	4.1	2.9	1.2	1.1	2.5	2.1	2.5	4.2	3.2
1978	3.2	3.7	3.2	2.6	2.5	3.2	1.9	1.3	1.7	4.2	3.5	5
1979	5.6	2.8	4.4	4.2	2.5	2.8	2.6	1.2	7.3	2.8	4.1	3.7
1980	2.7	4.4	2.9	2.8	2.2	1.8	1.4	4.6	1.4	2.1	3.4	3
1981	3.4	4.8	3.2	3.4	1.8	1.7	1.4	4.1	1.6	3	3.2	2.6
1982	3	2.7	4.1	2.5	1.8	2.7	1.7	1.2	1.2	2.7	3.2	3.1
1983	2.7	4.3	5.2	3.2	2.1	1.2	1.9	2.7	2.9	3.6	3.3	5.1
1984	6.4	3.4	4	2.1	2.9	1.8	1.3	2.3	5.1	3	5.1	3.4
1985	3	4.1	4.1	3.9	1.3	1.9	4	2.2	3.6	2.4	6.2	3.8
1986	4.7	3.3	4	2.1	2.5	1.5	1.3	2.1	1.9	3.6	3.1	4.1
1987	4.7	2.8	5.2	2.2	3.4	2.6	1.6	1.4	0.9	3.3	3.4	3.3
1988	4	2.6	2.3	2.5	2.1	2.9	1.4	2	3.4	2.4	2.5	2.1
1989	2.3	2	3.7	1.4	1.8	1.1	0.9	1.8	2.2	2.4	1.6	2
1990	2.2	3.1	3.4	2.6	1.9	1.2	1.4	0.9	1.1	2.4	3.4	3.5
1991	2.6	2.1	3.3	2.5	3.5	1.7	1	1.3	1.7	2.8	2.2	4
1992	2.5	1.8	2.7	2.7	1.6	1.3	1.1	6.1	1.3	3	3.1	2.1
1993	3.9	2.5	5.1	2.5	2	1.8	0.9	1.6	2.1	2.8	2.3	3.5
1994	3.1	4	3.6	2	2.7	1.2	1.4	1.5	1.6	2.8	5.7	3.6
1995	3.1	1.8	2.8	1.9	1.3	1.9	2.6	4.6	1.4	2.7	1.9	2.5
	MEAN SDE	CTRAL W	AVE HEIG	HT (m)					1			
			PERIOD (s						7.6			
			2.5 DEGRE		R) DIRECT	ION BAND	(den)		7.0 45			
			ION OF WA				(ucg)		0.6			
			ION OF WA		· ,				3.6			
	LARGEST			ve II (St	50)				7.3			
			ιο (III) ΓΕD WITH I	ARGEST	WAVE Hm	o (sec)			7.3 11			
			SSOCIATE			` '	ea)		50			
			o OCCURR		WOLOT W	AVE 110 (u	~9 <i>)</i>	12:00 pm	Septembe	r 3 1070		

Table A-3

Percent Occurance (x1000) of Wave Height and Period for All Directions (WIS Station A2010)

\\/ \ \ / E				PEAK I	PERIOD	(IN SEC	ONDS)				WAVE PEAK PERIOD (IN SECONDS)								
HEIGHT (M)	<4.0	4.0 -	5.0 -	6.0 -	7.0 -	8.0 -	9.0 -	10.0 -	11.0 -	>12.0	TOTAL								
HEIGHT (WI)	<4.0	4.9	54.9	6.9	7.9	8.9	9.9	10.9	11.9	>12.0	TOTAL								
.0099	6440	12005	6493	4827	4553	4409	3723	3406	3292	11486	60634								
1.00-1.99		1632	8018	9079	2883	1887	1803	1131	918	4664	32015								
2.00-2.99			30	450	2648	1579	297	224	165	556	5949								
3.00-3.99			1		58	402	506	46	15	59	1087								
4.00-4.99			3			20	121	77	11	1	233								
5.00-5.99							8	10	23	5	46								
6.00-6.99								8		3	11								
7.00-7.99									1		1								
8.00-8.99											0								
9.00-9.99											0								
10.00+											0								
TOTAL	6440	13637	14545	14356	10142	8297	6458	4902	4425	16774									
	MEAN $Hmo(M) = 1.0 LARGEST Hmo(M) = 7.3 MEAN TP(SEC) = 7.6$																		

associated with the largest wave, which is 11.0 sec (Table A-2). Using the above values and equations, the predicted depth of closure is 29.3 feet.

A-14. The depth of closure was also calculated using the Birkemeier equation (Birkemeier, 1985). This approach typically provides a more reasonable estimate, compared to Hallermeier's approach, which usually over-predicts the depth of closure. The Birkemeier equation is as follows:

$$d_c = 1.75 \text{ H}_e - 57.9 (\text{H}_e^2/\text{gT}_e^2)$$

A-15. This approach yields a depth of closure of 22.5 feet, which is a more reasonable estimate than Hallermeier's, but it is still deeper than the inner reef. This is an indication that sand could be lost offshore, but these depths of closure are not recommended for use in the design of Segment II beaches.

A-16. Analysis of the 1983 Pompano Beach/Lauderdale-by-the-Sea fill project performance, historic beach profiles for Ft. Lauderdale, and the nearshore hardbottom locations suggest that there is not a single DOC. The DOC was individually determined for each profile line by comparing beach profiles and determining at what depth the profiles converge. For Pompano Beach/Lauderdale-by-the-Sea, the pre-construction 1983 beach profiles were compared against the 1983 post-construction, 1993, and 1998 beach profiles (Sub-Appendix A-1). For example, Figure A-2a shows that for R-38 the DOC is 13.5 feet NGVD. The DOCs for Ft. Lauderdale were determined by comparing the 1980, 1993, and 1998 measured beach profiles. Since there has never been a nourishment project in Ft. Lauderdale, the DOCs are entirely based upon historic movement of the individual profile lines. An example profile (R-59) is shown in Figure A-2b, which shows a DOC of 13.0 feet NGVD.

A-17. The DOCs used for engineering analysis are shown in Table A-4. The overall average DOC for Reaches 2 and 3 is 13.4 feet NGVD. The average DOC for Ft. Lauderdale's Reach 3 is 14.4 feet NGVD, which is 1.8 feet deeper than the DOC for Reach 2. This is due to the influence of the inter-reef flats. In general, the beach profiles truncate on a reef flat for Pompano Beach/Lauderdale-by-the-Sea. The beach profiles for Ft. Lauderdale truncate near the reef, where there is, generally, higher relief.

SEA LEVEL RISE

A-18. The geological record of historic sea level variations indicates that both increases and decreases in global sea level have occurred. Some authorities claim that evidence indicates our planet may be entering a new ice age, which would result in a lower sea level. Others argue that increasing atmospheric concentrations of carbon dioxide and other gases are causing the earth to warm, contributing to a sea level rise. Such changes to absolute global sea level change are known as eustatic sea level change. The sea level rise rate for this study is 0.0075 ft/yr, based on data at Miami Beach (Lyles et al., 1988). For a 50-year project life, the sea level is predicted to rise 0.38 feet, but it is predicted to rise only 0.14 feet for the remaining 19 years of the project.

Example Depth of Closure for Pompano Beach/Lauderdale-by-the-Sea (R38)

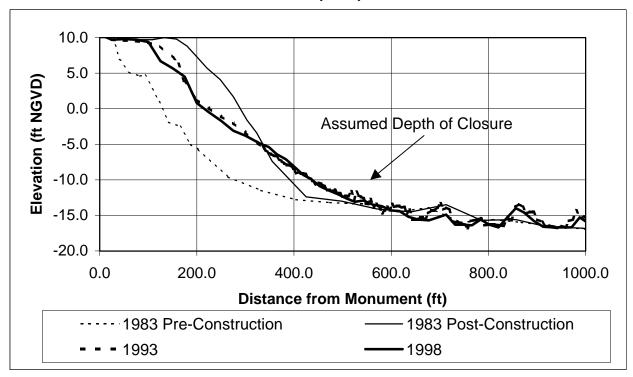


Figure A-2a

Example Depth of Closure for Ft. Lauderdale (R59)

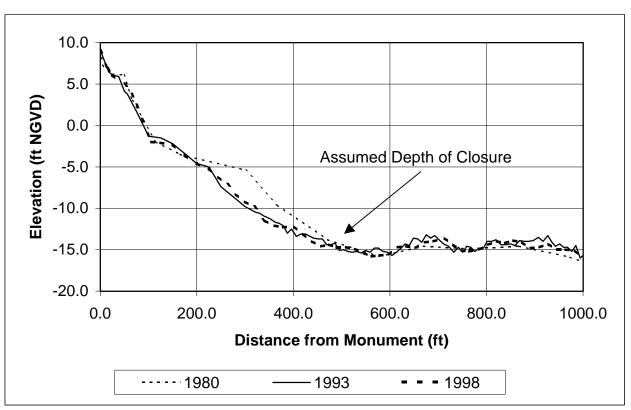


Figure A-2b

TABLE A-4
Estimated Depth of Closure

Rea	ch 2	Rea	ch 3
Pompano E	Beach/LBTS	(Ft. Lau	derdale)
	$\mathrm{DOC}^{(\mathrm{I})}$		DOC ⁽¹⁾
Monument	(-ft NGVD)_	Monument	(-ft NGVD)
R36	12.0	R54	13.5
R37	15.0	R55	15.5
R38	13.5	R56	15.0
R39	.12.5	R57	15.5
R40	14.0	R58	15.5
R41	13.0	R59	13.0
R42	10.0	R60	14.0
R43	10.5	R61	12.0
R44	9.5	R62	15.0
R45	12.0	R63	14.5
R46	12.5	R64	15.5
R47	13.0	R65	14.5
R48	11.0	R66	14.5
R49	11.0	R67	14.0
R50	11.0	R68	14.0
R51	13.0	R69	15.0
R52	16.5	R70	16.5
R53	14.0	R71	16.0
		R72	12.0
Average	12.4	R73	13.0
		R74	10.0
		Average	14.2
Overall	Average	1.	3.4

(1) Depth of Closure (DOC) determined by historic profile convergence

A-19. In 1995, the U.S. Environmental Protection Agency (EPA) published a report entitled *The Probability of Sea Level Rise* (Titus and Narayanan, 1995). This report provides sea level information in a form that can be incorporated into engineering designs, decision analyses, and legal opinions. The report presents a methodology for estimating sea level rise at a particular location by simply adding the current rate of sea level rise (based on historical data) to a normalized projection. The normalized projections estimate the extent to which future sea level rise will exceed what would have happened if current trends simply continued. They are based on initial conditions which correspond to the year 1990. For this study Miami Beach, Florida was chosen as the best data site, as it is the location closest to Broward County for which historic water level information was available. The historic rate of sea level rise at Miami Beach was estimated as 0.0075 ft/yr (Lyles et al., 1988).

SHORELINE EROSION AND RECESSION DUE TO SEA LEVEL RISE

A-20. Experience indicates that as relative sea level rises, the shoreline will be subjected to increased flooding and profile recession. Bruun (1962) proposed a formula for estimating the rate of shoreline recession based on the local rate of sea level rise. This methodology also includes consideration of local topography and bathymetry. Bruun's approach assumes that with a rise in sea level, the beach profile will attempt to re-establish the same bottom depths relative to the surface of the sea that existed before the sea level rise. As a result, the beach profile shape relative to the mean water level will re-establish itself. If the longshore littoral transport in and out of a given shoreline area is equal, then the quantity of material required to reestablish the nearshore slope must be derived from erosion of the shore. Shoreline recession resulting from sea level rise can be estimated using Bruun's Rule, as defined below:

x = ab/(h+d)

where,

b =

x = shoreline recession (in feet) attributable to sea level rise.

h = elevation of shoreline above NGVD (+9.0 feet berm).

d = depth contour beyond which there is no significant sediment motion (13.4 feet, yearly depth limit).

horizontal distance of the active beach profile (average 500 feet)

berm elevation to the depth contour d.

a = specified relative sea level rise for time period t.

A-21. This procedure is only used for estimating long term changes and not as a substitute for the analysis of historical shoreline and profile changes. Throughout the 50-year project the predicted shoreline recession is 8.4 feet (0.17 ft/yr). The shoreline is predicted to recede only 3.2 feet for the remaining 19 years. The recession rate of 0.17 ft/yr due to sea level rise is not significant when compared to historical shoreline change. Under the present sea level rise rate, it is not necessary to include sea level rise as a design parameter for the Federal project. The effect of sea level rise on the Federal project should be reconsidered if the rate of measured sea level rise increases significantly.

COASTAL PROCESSES

A-22. Segment II has been divided into four reaches based upon common shoreline and volumetric characteristics and political boundaries. The reaches are defined in Table A-5 (Figure A-1). All shoreline changes are based on the movement of the mean high water (MHW) with an elevation of +1.9 feet NGVD. The volumetric changes were calculated to -16 feet NGVD. This depth, instead of the DOC, was used so that the volumetric analysis could be compared to past studies, where a DOC of -16 feet NGVD was assumed. Shoreline and volumetric changes are summarized in Table A-6 and Figures A-3a and A-3b.

TABLE A-5
REACHES DEFINED FOR SEGMENT II

Reach	Area	From	То	Length (mi)
1	Northern Pompano Beach	R25	R36	2.0
2	Southern Pompano Beach & Lauderdale-by-the-Sea	R36	R54	3.4
3	North Ft. Lauderdale	R54	R74	4.0
4	South Ft. Lauderdale	R75	R85	1.9
Total		R25	R85	11.3

TABLE A-6 VOLUME AND SHORELINE CHANGE RATES

			Total	Average
Reach	Monuments	Reach Length	Volume Change	Shoreline
		(ft)	$(cy)^{(1)(2)}$	Change
				$(ft/yr)^{(1)(2)}$
Reach 1	R25-35	10,500	383,300	1.0
Reach 2a	R36-43	7,700	-191,500	-4.6
Reach 2b	R44-53	10,100	250,500	-4.4
Reach 3	R54-74	21,100	-71,000	-0.2
Reach 4	R75-84	10,000	114,000	1.8
Reaches 2 & 3	R36-74	38,900	-12,100	-3.0
Total	R25-84	59,300	485,300	-1.3

Notes:

- (1) Reaches 1 and 2 data are from August 1983 to September 1998
- (2) Reaches 3 and 4 data are from October 1993 to September 1998

Pompano Beach/Lauderdale-by-the-Sea Shoreline and Volumetric Change Rates (August 1983 to September 1998)

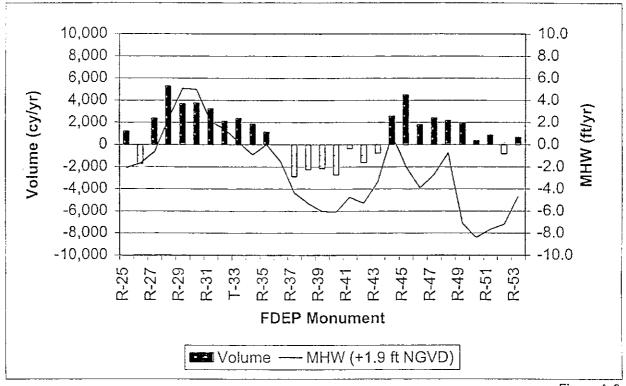


Figure A-3a

Ft. Lauderdale Shoreline and Volumetric Change Rates (October 1993 to September 1998)

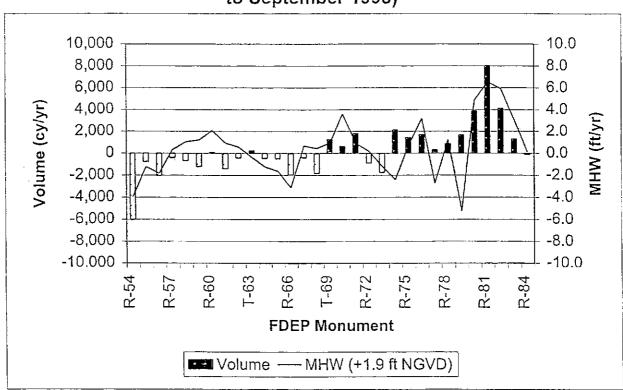


Figure A-3b

HISTORICAL SHORELINE CHANGE

Pompano Beach/Lauderdale-by-the-Sea

- A-23. <u>1929 to 1961</u>. The average annual recession rate for Pompano Beach and Lauderdale-by-the-Sea ranged from –4 to -8 ft/yr (USACE, 1994). There were regions of erosion and accretion, with the highest erosion downdrift of Hillsboro Inlet. The erosion at the inlet was due to inlet effects and sparse sand bypassing for this time period.
- A-24. 1970 to 1978. Initial construction of the Federal project was completed in 1970 between R-31 and R-49. The average shoreline change of the constructed beach between R-32 and R-49 was -22 ft, resulting in an average shoreline recession rate of 2.8 ft/yr (USACE, 1981). The project area was erosional, except for an accretional section from R41 to R46. In the erosive sections (R32-R40 and R47-48), the average erosion rate was 6.3 ft/yr. Much of this erosion can be attributed to initial cross shore adjustment of the beach fill.
- A-25. <u>1983 to 1988</u>. Following the 1983 nourishment project, the shoreline (from FDEP monuments R25 to R53) experienced recession of 56 ft at a rate of 11.2 ft/yr. The shoreline was accretional only from R29 to R32 at a rate of 3.6 ft/yr (USACE, 1994). The recession is mainly a result of the initial adjustment of the nourishment.
- A-26. <u>1983 to 1998</u>. In Reach 1 (Figure A-1), the shoreline has accreted a total of 14.7 ft from 1983 to 1998, or an annual average of 1.0 ft/yr (Table A-6). Overall, this reach is accretional or stable, because of the increased transfer of sand across Hillsboro Inlet since the mid-1980's. The only erosional profile lines in this reach are from R25 to R27, adjacent to Hillsboro Inlet, probably due to the shadow effect of the inlet (Figure A-3a).
- A-27. 1983 to 1988. Reach 2 (Figure A-1) has lost an average of 67 feet (4.5 ft/yr) of shoreline. There are areas within this reach (R49-52) which have erosion rates of more than 7.0 ft/yr (Figure A-3a). Some of the shoreline recession is the expected profile adjustment of the 1983 nourishment. The hotspot from R37 to R43 is a result of the shoreline headland feature in this area. Also, there is a gap in the reef system in the proximity of R48 (OAI/CPE, 1998). This potential offshore sink for sediment, may have contributed to the shoreline recession from R45 to R53.

Ft. Lauderdale

- A-28. <u>1947 to 1978</u>. From FDEP monuments R54 to R69, the shoreline retreated an average of 44.4 ft (1.4 ft/yr). No areas in this section of Ft. Lauderdale were accretional (USACE, 1981).
- A-29. 1979 to 1993. Between 1979 and 1993, the average net shoreline change for Reach 3 (Figure A-1) has been 0.2 ft/yr (USACE, 1996). This reach has alternating regions of erosion and accretion. There are accretional sections from R54-R59, where the beach has accreted as much as 3 ft/yr, and R64 to R69, where there was mild accretion. R60 to R63 shows mild erosion and R70 to R74 was eroding at more than 1.5 ft/yr.

- A-30. 1979 to 1993. Reach 4 is erosional where it borders with Reach 3, though the reach is accretional near Port Everglades due to the trapping of the southerly longshore sediment transport updrift of the inlet. The southern Ft. Lauderdale shoreline advanced an average total of 44.5 feet. The area closest to Port Everglades advanced an average total of 97.3 feet, while the region between R-75 to R-79 receded a moderate total of -8.3 feet.
- A-31. <u>1993 to 1998</u>. From 1993 to 1998, the shoreline for Reach 3 (Figure A-1) has lost an average of 0.9 ft. (-0.2 ft/yr). Areas of erosion and accretion alternate alongshore, with a maximum advance of 17.7 feet at R-70 and a maximum recession of -19.5 feet and -15.3 feet at R-54 and R-66, respectively (Figure A-3b). Overall, this reach is moderately erosive.
- A-32. 1993 to 1998. Reach 4 (Figure A-1) is accretional, advancing an average total of 8.7 feet (Figure A-3b). Profile lines R77 and R79 have eroded a total of 13.4 ft and 25.7 ft, respectively, and are the only receding profiles. Overall, this reach has been accretional for the past 50 years, due to the impoundment of sand updrift of Port Everglades entrance.

HISTORIC VOLUME CHANGE

Pompano Beach/Lauderdale-by-the-Sea

- A-33. <u>1929 to 1978</u>. Pompano Beach and Lauderdale-by-the-Sea lost an average 33,300 cy/yr of sand to the -18 ft. NGVD contour (USACE, 1963). The 1970 project lost a total 292,000 cy of sand (to the -12 ft NGVD contour) in the 8 years after construction (USACE, 1994), which is 27% of the total volume placed.
- A-34. <u>1983 to 1988</u>. The 1983 Nourishment Project lost a total of -82,700 cy of sand (16,500 cy/yr) to the -12 ft NGVD contour (USACE, 1994) by 1988. Nevertheless, the project losses to the -6 ft NGVD contour were 350,800 cy. This indicates that between the -6 ft NGVD and the -12 ft NGVD contour, 268,100 cy of material were gained. Though sand is expected to move from the dry beach to offshore as the beach fill equilibrates, profile comparisons suggest that the profiles also flattened.
- A-35. <u>1983 to 1998</u>. From 1983 to 1998, Reach 1 gained 383,300 cy (25,600 cy/yr) of material (Table A-6) because the rate of mechanical inlet bypassing increased in the mid-1980's from the order of 60,000 cy/yr to 130,000 cy/yr (Table A-7).
- A-36. 1983 to 1998. Reach 2 has gained 58,900 cy of material. Dividing the reach into two sections (Reach 2a and 2b) shows that from R36 to R43 the beach lost 191,500 cy (12,800 cy/yr) and from R44 to R53 the beach gained 250,500 cy (16,700 cy/yr) of sand (Table A-6). The loss in Reach 2a is consistent with shoreline retreat in this region, but the volume gain in Reach 2b is not consistent with the shoreline recession, which will be addressed in the next section.

Ft. Lauderdale

A-37. 1929 to 1978. Ft. Lauderdale beaches (From FDEP monument R54 to R84) have lost a total of 592,200 cy of material, or an average of 12,100 cy/yr (USACE, 1981). The area updrift of Port Everglades began to stabilize after 1961, when a submerged spoil bar was created north

of the channel as a result of material dredged from the adjacent Port Everglades entrance channel.

A-38. 1979 to 1993. From 1979 to 1993, Reach 3 gained a total of 52,000 cy of sand, but there is an erosional area from R64-R66, which lost 289,200 cy of sand (USACE, 1996). Some of the accretion may be attributed to spreading losses of the 1983 Pompano Beach/Lauderdale-by-the-Sea Project.

A-39. <u>1979 to 1993</u>. Reach 4 has gained a total of 83,100 cy of sand from 1979 to 1993. Though this reach is overall accretional due to updrift effects of Port Everglades, there was a highly erosive area form R75 to R78 (USACE, 1995) which lost 154,800 cy of material. The shoreline recession and volume loss from R75-R78 may be related to a discontinuity in the reef line (OAI/CPE, 1998).

A-40. <u>1993 to 1998</u>. From 1993 to 1998, Reach 3 lost a total of 71,000 cy of sand (Table A-6). Only a few profile lines showed accretion, most significantly at R69 to R71 and R74 to R75 (Figure A-3b).

A-41. <u>1993 to 1998</u>. Reach 4 continued to accrete 114,000 cy of sand due to the updrift effects of Port Everglades (Table A-6). Only one profile, R-84, showed a small amount of erosion (Figure A-3b).

VOLUME CHANGE AND SHORELINE CHANGE CORRELATION

A-42. For some areas in Segment II, changes in shoreline and sand volume do not correlate (USACE, 1995; OAI/CPE, 1998). Reach 2b shows volumetric accretion, but with significant shoreline recession (Figure A-3a). The lack of correlation may be caused by physical processes. The fill sand placed in 1970, or 1983 may have been finer than the native beach sands. Generally, finer sands create a flatter beach profile, causing increased sand deposition offshore. The Structural Stabilization Study (OAI/CPE, 1998) observed that some profiles were not in equilibrium prior to the 1983 renourishment, with a steep, highly eroded profile. The 1983 nourishment provided enough sand to bring the submerged portion of the active beach back towards equilibrium, but with a disproportionate loss from the upper profile. In either case, the beach needs to be renourished in spite of the volumetric accretion in the region.

INLET IMPACTS

A-43. Hillsboro Inlet and Port Everglades' entrance have positive impacts on the Pompano Beach-Ft. Lauderdale segment. Typically, beaches downdrift of an inlet are erosional, unless the sand that accumulates on the updrift beach and in the inlet can be transferred to the downdrift beach. Material is mechanically bypassed around Hillsboro Inlet to Pompano Beach, and the rate has increased since the mid-1980's (Table A-7). The bypassing rate for 1989-1998 (134,300 cy/yr) is more than double the 1979-1988 (64,800 cy/yr) rate. This rate is maintaining northern Pompano Beach (Reach 1) which it was erosional in prior decades. The 1983-1998 volumetric change for Reaches 1, 2a, and 2b was 442,200 cy of accretion. During this timeframe bypassing

was 1,849,400 cy. It is recognized that a small amount of sand (about 10,000 cy/yr) returns to the inlet (CPE, 1992) as a result of northerly transport. The wave-induced loss of sand on Reaches 1, 2a, and 2b between 1983 and 1998 is equal to the measured gain (442,200 cy) minus the net bypassing (1,699,400) or -1,257,200 cy.

TABLE A-7
HILLSBORO INLET DREDGE AND BYPASSING VOLUMES
(cy)

YEAR	QUANTITY	YEAR	QUANTITY
1979	22,000	1989	136,500
1980	25,000	1990	167,900
1981	25,000	1991	93,600
1982	70,000	1992	160,100
1983	51,100	1993	161,700
1984	60,300	1994	162,400
1985	108,800	1995	138,500
1986	134,000	1996	139,100
1987	62,200	1997	100,500
1988	90,200	1998	82,400
SUB-TOTAL (1979 AVERAGE AN	-1988): 648,400 NUAL RATE: 64,800	SUB-TOTAL (1989-1	.998): 1,342,772 UAL RATE: 134,300

TOTAL: (1979-1998) 1,991,172 AVERAGE ANNUAL RATE: 99,559

A-44. Port Everglades' entrance, with its long jetties, acts as a barrier and trap to sediment movement in southern Ft. Lauderdale (Reach 4). The realignment of the north jetty in 1980 increased the trapping capacity. The submerged spoil mound north of the inlet acts like a submerged jetty, further increasing the trapping capacity. The trapped sand has created a stable or accreting beach for almost two miles north of the inlet.

EXISTING SHORELINE STRUCTURES

A-45. The majority of the upland development of Pompano Beach, Lauderdale-by-the-Sea, and Ft. Lauderdale are protected by structures. Approximately 69% of the properties contain structures (USACE, 1996). The primary structures are low seawalls protecting private development with a setback from the water's edge (Table A-8). However, nearly a mile of Segment II is protected by seawalls over 10 feet in height. The improvements made to Highway A1A in Ft. Lauderdale in the late 1990's added a small seawall along the landward edge of the beach, increasing the small seawall length by 8,150 feet. Since the seawall is built only on a

spread footer, it provides little protection against beach erosion and storm recession. Two derelict groins were identified near R-40 in Pompano Beach during a February 2000 field inspection. One groin (remnants of the New River Inlet jetties) is located near R-79 in southern Ft. Lauderdale. Two fishing piers exist within the project area.

TABLE A-8
STRUCTURAL ARMORING INVENTORY
FOR SEGMENT II

	NUMBER		
ITEM	OF	LENGTH	PERCENT
	STRUCTURES	(feet)	
Wall: Small	124	32,280	40.5%
Wall: Med	48	11,600	19.5%
Wall: Large	14	4,900	8.2%
Rubble: Small	5	690	1.2%
Total	191	41,320	69.4%

Note: Data Based on USACE (1995).

BEACH SLOPES

A-46. The Segment II beaches do not have a uniform sand grain size (SEAI, 1999) and a portion of the segment was renourished in 1983. Furthermore, sand is continually bypassed from Hillsboro Inlet, so due to the variety of beach materials, the equilibrium beach slopes are not uniform in Segment II. The traditional design methods used for the authorized project use a single template of the entire project area. A more accurate prediction of profile performance is achieved when actual profile slopes are considered by reach. The slopes are based upon the 1998 survey, were calculated for Reaches 2a, 2b and 3, and are shown in Table A-9. Equilibrium beach slopes should be similar to the 1998 slopes.

TABLE A-9

AVERAGE BEACH CHARACTERISTICS

		Beach Slope	es (1V:xH)	Authorized Sl	opes (1V:xH)
Location	Monuments	Berm to -2.5 ft NGVD	-2.5 ft to -13.5 ft NGVD	Onshore	Offshore
Reach 2a	R36-43	13	28	15	30
Reach 2b	R44-53	14	35	15	30
Reach 3	R54-74	11	29	15	30

Note: 1) Beach slopes are based on 1998 data.

BORROW AREA COMPATIBILITY

A-47. A sediment compatibility analysis was conducted for each borrow area and the existing beach material. The composite grain size distributions were used to represent the potential offshore borrow areas (Appendix E). Appendix E identifies seven borrow areas that can be utilized for this project, though only Borrow Areas I and II will be considered for use in Segment II because of proximity of the borrow areas to the beach segments and compatibility.

A-48. Sand is considered compatible with the existing beach if it has the same mean grain size or is coarser. However, if the beach fill material is finer than the existing material, an additional amount of fill material is necessary. The beach slope is a function of sand size; a beach with fine sand is more mildly sloped than a beach which has coarser sand. When fill material is finer than the existing sand, extra fill is necessary to account for the more mild beach slopes.

A-49. For this study, a modified equilibrium method was used (Munez-Perez, et al., 1999). The equilibrium method employs a shape factor, which is a function of mean grain size (Dean, 1991), but, the equilibrium method does not take into account hardbottom or offshore reef features. The modified equilibrium method uses a shape factor that is a function of grain size, depth of hardbottom, and the cross-shore width of the hardbottom. The estimated overfill volumes (cy/ft of beach) are shown in Table A-10. Borrow Areas I and II are compatible with Segment II beaches.

TABLE A-10

ESTIMATED OVERFILL DENSITY

(cy/ft)

		Reach 2a	Reach 2b	Reach 3
Borrow Area		(R36-43)	(R44-53)	(R54-74)
Number	Grain Size (mm)	0.27	0.29	0.33
I	0.39	0.0	0.0	0.0
II	0.31	0.0	0.0	0.0

STORM SURGE

- A-50. Storm surge is defined as the rise of the ocean surface above its astronomical tide level due to storm forces. The increased elevation is attributable to a variety of factors, which include waves, wind shear stress, and atmospheric pressure. An estimate of these water level changes is essential to the design of the berm elevation of a beach fill area. Higher water elevations will increase the potential for recession, long-term erosion, and overwash due to severe waves.
- A-51. The major threats to the shoreline of Broward County are surge and waves caused by extra-tropical and tropical storms. Since 1960, major storms that have affected Broward County include Hurricane Donna (1960), Hurricane Cleo (1964), Hurricane Isbell (1964), Hurricane Betsy (1965), Hurricane David (1979), Hurricane Andrew (1992), Tropical Storm Gordon (1994), Tropical Storm Josephine (1996), Tropical Storm Mitch (1998), and Hurricane Irene (1999). Four notable northeaster storms that have influenced the Broward County shoreline occurred in March 1962, November 1984, October 1991 and October 1992. It is possible to classify and predict storm surge elevations for various storms through the use of historical information and theoretical models.
- A-52. The Federal Emergency Management Agency (FEMA) has performed investigations to determine 10 to 100 year return period storm surge elevations for Broward County (USACE, 1995). The methodology used in this study was developed by the National Academy of Sciences. Assumptions made in the analysis include: 1) breaking wave heights are limited to 0.78 of the local still water depth, 2) the wave crest constitutes 70% of the wave height, and 3) waves are dissipated by features such as sand dunes, dikes and seawalls, buildings, and vegetation. Regeneration of wave heights over areas of large fetch was also considered. Figure A-4 includes the resulting surge elevations and frequency of occurrence for the Broward County coast. For the 100-year return interval, the maximum predicted crest elevation is 7.5 feet.
- A-53. Higher frequency of occurrence storms and storm surge elevation for other meteorological induced water-level anomalies (i.e., northeaster storm types) were obtained from WIS Report 7 (USACE, 1995). Hindcasting of storm surges was performed utilizing historical wind and pressure fields.

A-54. The FEMA hurricane surge curve is based on data points for the 10, 50, 100, and 500 year recurrence interval events. The WIS northeaster surge curve for Broward County is based on data points for the 2, 5, 10, 20 and 50 year recurrence intervals at Miami Beach, Florida. The WIS northeaster surge data does not include tide, therefore, since the normal duration of a northeaster is several days (i.e., several tidal cycles), a curve which provides the WIS northeaster surge height with a spring tide, a worst case scenario, is included on Figure A-4. The FEMA hurricane surge curve is extrapolated below the 10 year recurrence interval event and the WIS northeaster surge curve is extrapolated above the 50 year recurrence interval event. For this reason, considerable care should be used when selecting data points from the extrapolated portion of the curves.

CROSS-SHORE SEDIMENT TRANSPORT

A-55. Cross-shore sediment transport characteristics for the project area beaches were estimated using the Storm Induced BEAch CHange model, SBEACH (Larson and Kraus, 1989), which simulates beach profile changes resulting from varying storm waves and water levels. SBEACH has significant capabilities that make it useful for quantitative studies of beach profile response to storms. SBEACH version 3.0 is additionally capable of calculating the effect of nearshore hardbottom on profile evolution.

A-56. A formal calibration and verification of the model within the project area could not be conducted due to the lack of historical profile data. As an alternative, a sensitivity analysis was conducted based on SBEACH coefficients used in previous studies within the South Florida Region. SBEACH was run on three profiles representative of the project area with storm input data from three separate storms. Sequential runs were conducted using each of the reported sets of calibration coefficients, and the resulting profile recession for each reach was tabulated (Table A-11). Based on these results the coefficient values used in Martin County (USACE, 1994) were adopted for this study, since these coefficients give results that are closest to the mean recession rates for all cases. The calibration procedure established the following values as the selected calibration parameters, a) transport rate coefficient (K) of 0.000015 m⁴/N, b) slope dependent coefficient (ε) of 0.0015 m²/s, and c) transport rate decay factor (LAMM) of 0.40 m⁻¹.

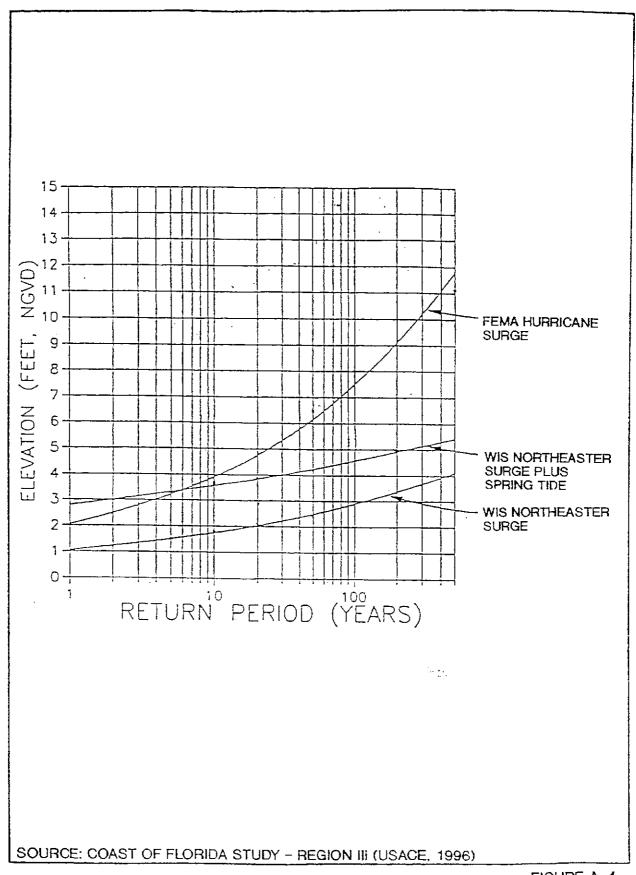


FIGURE A-4

BROWARD COUNTY STORM SURGE FREQUENCY CURVE COAST OF FLORIDA STUDY - REGION III

TABLE A-11 SENSITIVITY ANALYSIS FOR SBEACH CALIBRATION

	Distance from Pre-Storm MHW to Landward Limit							
			of 0.5					
Reach	Storm	COFS	Default	AVG (ft)	SD (ft)			
	E24	0	0	0	0	0	0	0
R86-	H16	166.0	162.9	174.7	167.7	152.3	164.7	8.2
R99	H31	157.4	159.9	166.0	163.2	163.8	164.1	4.5
	E24	41.0	43.3	41.0	41.5	41.4	41.6	1.0
R100-	H16	169.6	188.3	186.0	186.9	185.9	183.3	7.8
R104	H31	201.5	224.9	214.6	206.4	214.2	212.3	8.9
	E24	0.0	41.7	39.1	38.8	38.5	31.6	17.7
R105-	H16	137.0	144.0	159.9	159.1	133.8	146.8	12.2
R128	H31	132.7	142.2	136.0	130.0	138.4	135.9	4.8

Adjusted Calibration Parameters						
Project	COFS	Default	Ponce	Brevard	Martin	
$K (m^4/N)$	1.35E-06	1.75E-06	1.75E-06	1.70E-06	1.50E-06	
EPS (m^2/s)	0.001	0.002	0.001	0.001	0.0015	
LAMM (m ⁻¹)	0.5	0.4	0.5	0.5	0.4	

A-57. The cross-shore sediment transport analysis procedure involved the use of the SBEACH model to perform multiple simulations of beach recession due to historical tropical and extratropical storms. Since Reaches 1 and 4 are not being considered for nourishment, only two reaches were examined. Pompano Beach/Lauderdale-by-the-Sea extends from FDEP monument R36 to R53 (Reach 2). The Ft. Lauderdale segment extends from R54 to R74 (Reach 3). For each reach, one representative FDEP profile was adopted for use within the SBEACH simulations. For the Pompano Beach/Lauderdale-by-the-Sea section, R38 was adopted as the characteristic profile, and R64 was chosen for Ft. Lauderdale (Sub-Appendix A-1).

A-58. <u>Joint-Probability Analysis of Storm-induced Beach Recession</u>. Proposed shore protection measures must be subjected to a benefit-cost analysis in order to assess whether Federal participation in the project is appropriate. Primary benefits are typically quantified in terms of the reduction of storm-induced damages to existing property and/or structures. In order to quantify those benefits, one must estimate a) the damage potential which exists without the proposed protection measures (i.e., for existing conditions), and b) the damage potential which exists with shore protection measures in place. Benefits are expressed as the reduction in storm-

induced damages resulting from the presence of the shore protection measures. In order to account for risks and uncertainties inherent to the analysis procedure, methods were required in the form of recession versus frequency of occurrence relationships. The Empirical Simulation Technique (EST) (Borgman et al., 1992) was selected as the joint-probability analysis tool used to establish those relationships. The beach recession analysis procedure can be described by applying the following major tasks:

- 1. Identify storm events that have impacted the study area.
- 2. Construct or obtain the water surface elevation and wave field hydrographs characteristic of each of the identified storms while in the vicinity of the study site.
- 3. Apply the numerical model, SBEACH, to estimate the beach recession associated with each of the storm events.
- 4. Construct EST input data files using descriptive storm parameters and calculated recession values.
- 5. Use the EST to generate multiple repetitions of multi-year scenarios of storm events and their corresponding beach erosion confidence limits.
- 6. Apply the resulting recession-frequency curves as input to an appropriate economics based model for computation of damages, costs, and benefits.
- A-59. The initial step in any storm-induced recession/frequency analysis is identification of all historical storms that have impacted the area of interest. For Atlantic coast sites, such as Broward County, the shoreline is subjected to both tropical cyclones (tropical depressions, tropical storms, and hurricanes) and extratropical storms (northeasters). While tropical storms are often characterized by very high wind, wave, and surge conditions, the longer duration of extratropical storms can result in beach erosion of equal or greater magnitude than the erosion caused by storms of tropical origin. Once the historical storms of interest are identified, corresponding storm surge hydrographs and wave condition time series must be extracted from appropriate data sources. For this application, those data sources consisted of the DRP storm surge database and the WIS hindcast wave database.

A-60. Tropical Cyclone Selection. The tropical surge database developed by Coastal Hydraulics Laboratory (formerly CERC), which contains a record of 104 years of tropical storm activity, indicates that 12 tropical cyclones have significantly influenced the project area. This corresponds to a recurrence frequency of roughly one tropical cyclone every nine years. For this application, a significant influence implies the storm resulted in a surge of at least 1.64 feet at the site in question. The 12 storms identified for the project area are listed in Table A-12. Individual storm tracks and maximum surge elevations at all nearshore stations are available in the tropical cyclone database summary report (Scheffner et al., 1994). Wave conditions characteristic of tropical cyclones were computed in accordance with procedures specified in the Shore Protection Manual (USACE, 1984). Storm position and intensity values were specified based on information from the National Hurricane Center Tropical Storm Database. Tidal influence was accounted for by assuming that each storm event has an equal probability of occurring at any time during the tidal cycle. For this analysis, that assumption was simplified by allowing the onset of the storm conditions to coincide with four individual tidal phases. Tidal constituents of the project site were obtained from the Dredging Response Project (DRP) database for computation of tide elevations. The result of combining storm surge and tidal

components of the total surge elevation is a four-fold increase in the number of individual storms used in the SBEACH analysis.

TABLE A-12
TROPICAL STORMS WITH INFLUENCE ON BROWARD COUNTY

Storm Number	NHC Database Number	Date	
	(Name)		
1	112	8/3/1899	
2	127	8/4/1901	
3	189	10/6/1909	
4	276	9/11/1926	
5	292	9/6/1928	
6	296	9/22/1929	
7	331	8/31/1933	
8	353	8/29/1935	
9	357	10/30/1935	
10	461	9/4/1947	
11	473	9/18/1948	
12	629	8/20/1964(Cleo)	

A-61. Extratropical Storm Selection. Analysis of the nearshore water level estimates within the DRP extratropical storm database indicate storm surge levels significantly less than expected for this region. The maximum surge value, which roughly corresponds to a 16-year surge event, was determined to be only 0.48 feet. Based on this result, an alternate method was used to generate the necessary surge data for the SBEACH extratropical storm simulations. Each extratropical storm event was first identified within the WIS wave data for station A2010 for the time period from September 1977 to August 1993. Each storm was then ranked based on the maximum wave height of each storm event. This ranking was then used to assign a relative return period (frequency) to the event. The surge magnitude for each storm was then determined based on the FEMA surge curve for the region and the relative frequency of each storm. SBEACH input storm hydrographs were developed based on these surge magnitudes using the storm hydrograph algorithm in the Beach Fill Module software package. Based on this procedure, 13 extratropical storms were identified for use within the SBEACH simulations (Table A-13). This corresponds to a significant extratropical event every 1.2 years. Wave conditions corresponding to each of the extratropical storms were obtained from the WIS hindcast database, Station A2010. This deepwater wave data was subsequently transformed to nearshore conditions for the depth corresponding to the offshore depth of the profiles used in the SBEACH simulations. This transformation was accomplished using the WAVETRAN application within the Shoreline Modeling System (Gravens, 1992).

TABLE A-13
EXTRATROPICAL STORMS WITH INFLUENCE ON BROWARD COUNTY

Storm	Date	Rank	Return Freq.	Surge (Feet)
Number			(Years)	
1	12/28/77	3	5.3	3
2	1/17/78	8	2	2.3
3	2/3/79	12	1.3	2.2
4	11/20/79	9	1.8	2.3
5	1/16/80	11	1.5	2.2
6	11/25/80	4	4	2.8
7	11/25/82	13	1.2	2.2
8	12/30/82	1	16	4.6
9	1/20/83	2	8	3.5
10	11/22/83	5	3.2	2.6
11	2/9/88	6	2.7	2.5
12	10/29/90	10	1.6	2.2
13	11/15/91	14	1.4	2.2

A-62. In summary, the selection of storm events from the available databases resulted in the identification of 12 tropical cyclones and 13 extratropical storms that have influenced Broward County beaches. The tropical storm database encompasses those storms that occurred during the 104-year period from 1886 through 1989. The extratropical storm database includes 16 years of data, from September 1977 through August 1993. Estimated frequencies of occurrence for tropical cyclones and extratropical storms that impact the project shoreline are 0.12 and 0.83 storms per year, respectively.

A-63. <u>SBEACH Model Results.</u> Beach recession for each of the extratropical and tropical storms for each tide phase was determined through application of SBEACH to each of the characteristic reach profiles. From these simulations, the beach recession for each storm was calculated for each reach. Throughout this discussion, recession is defined as the horizontal distance from the mean high water mark on the pre-storm profile to the most landward point where the vertical difference in pre- and post-storm profiles equals 0.5 feet.

A-64. Significant beach recession was observed for the majority of storm simulations. Pompano Beach/Lauderdale-by-the-Sea showed a greater maximum recession compared to the Ft. Lauderdale reach. The beach face is milder for Pompano Beach/Lauderdale-by-the-Sea than it is for Ft. Lauderdale (Table A-9). A beach with a mildly sloped beach face will experience greater storm recession than steeper beaches. The tropical storm runs generally produced greater recession than the extratropical storms. Recession results are summarized in Table A-14.

A-65. Overall, the SBEACH analysis produced appropriate data for the performance of the project cost-benefit analysis. The Empirical Simulation Technique (EST) (Borgeman et al.,

1992) was selected as the joint-probability analysis tool used to establish the relative costs and benefits of the proposed shore protection measures. The relative frequency and level of crosshore recession due to storm damage was quantified based on the SBEACH results for input into the EST analysis.

Table A-14

RECESSION RESULTS FOR SBEACH ANALYSIS

Reach (Storm)	Mean Recession (feet) ⁽¹⁾	Maximum Recession (feet) ⁽¹⁾
Pompano Beach/LBTS – Extratropical	64	98
Pompano Beach/LBTS – Tropical	90	215
Ft. Lauderdale – Extratropical	43	87
Ft. Lauderdale Tropical	78	188

(1) All recession distances are referenced to Mean High Water.

A-66. <u>EST Input Development</u>. The fourth step in the empirical simulation procedure involves preparation of the EST input files. These files contain input vectors, response vectors, and frequency of storm occurrence parameters. The values of the input parameters reflect the storm intensity. The response vector, in this application, quantifies the beach recession resulting from a given storm; and the storm frequency parameters are used to dictate the occurrence of extratropical and tropical storms throughout the multi-year life cycle analysis.

A-67. The characteristics of individual tropical storms were defined as: (a) tidal phase, (b) closest distance from the eye to the project site, (c) direction of propagation at time of closest proximity, (d) central pressure deficit, (e) forward velocity of the eye, (f) maximum wind speed, and (g) radius to maximum winds. As noted, the response to each storm was defined as the beach recession modeled by SBEACH. The frequency of occurrence of tropical events that impact the project beaches was previously estimated at 0.12 events per year. This corresponds to one event every 8.6 years.

A-68. Input vectors describing extratropical storms were defined as: (a) tidal phase, (b) storm duration, (c) maximum surge elevation, (d) wave height, and (e) wave period. The response vector was, of course, beach recession; and the frequency of occurrence of extratropical storms was previously estimated at 0.83 events per year.

A-69. <u>EST Execution</u>. The fifth step of the EST is the execution of empirical simulation procedures to generate multiple repetitions of multi-year scenarios in which storm events may occur. For this application, 100 repetitive simulations of a 200-year period of storm activity were performed. Simulations of extratropical and tropical storm histories were performed separately. For each simulation, a 200-year tabulation was generated to include the number of storms that occurred during each year and the corresponding beach recession. This information

provides the basis for calculation of return periods associated with various degrees of beach recession.

A-70. The final step in the EST procedure is analysis of results and presentation of those results in a format suitable for subsequent probabilistic analyses. In this case, the EST results were used as input for an economic evaluation of the impacts of beach recession. The economic model estimates damage and repair costs (related to storm-induced beach recession) that would be incurred over a multi-year period if no project improvements were constructed. The economic model makes no distinction between extratropical and tropical storms; therefore, the tropical and extratropical EST results were combined to generate a single storm-induced recession versus frequency of occurrence relationship.

The following algorithm was used to accomplish this combination of extratropical and tropical results:

For a given recession value: $T_c = (1/T_t + 1/T_e)^{-1}$

Where: T_c denotes return period corresponding to the chosen recession

 T_t represents the tropical storm return period corresponding to the chosen recession.

T_e equals the extratropical storm return period corresponding to the chosen recession.

A-71. As expected, due to their grater frequency of occurrence, the extratropical storms dominate the results corresponding to lower return periods. The greatest recession values were characteristic of the most severe tropical cyclones (i.e., hurricanes). Return periods associated with levels of combined tropical and extratropical storm-induced beach recession are provided in Figures A-5A and A-5B. Standard deviations of the expected recession for the range of return periods are also presented.

A-72. <u>Summary of Cross-Shore Transport Analysis</u>. The preceding information was provided to summarize how EST procedures were applied to this probabilistic analysis of cross-shore sediment transport in Broward County. This application generated frequency of occurrence relationships for storm-induced beach recession along Segment III of the Broward County shoreline, as tabulated above. The beach recession-frequency relationships were subsequently utilized as input to economic model for quantification of recession related damages to shorefront properties.

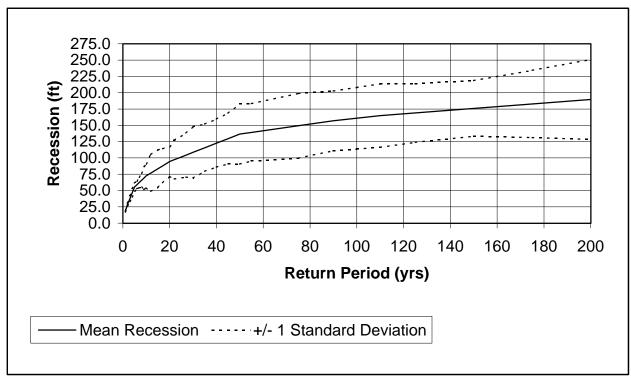


FIGURE A-5a

EST Recession (Pompano Beach/Lauderdale by the Sea)

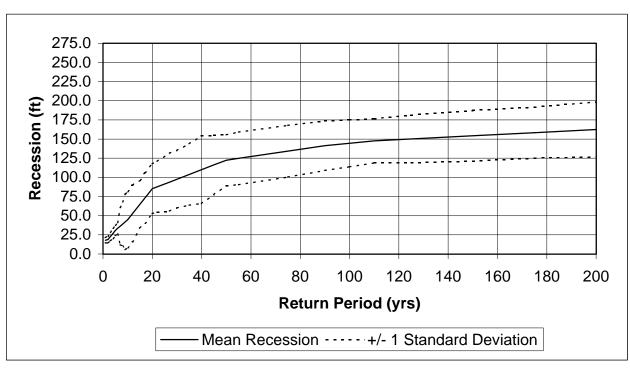


FIGURE A-5b

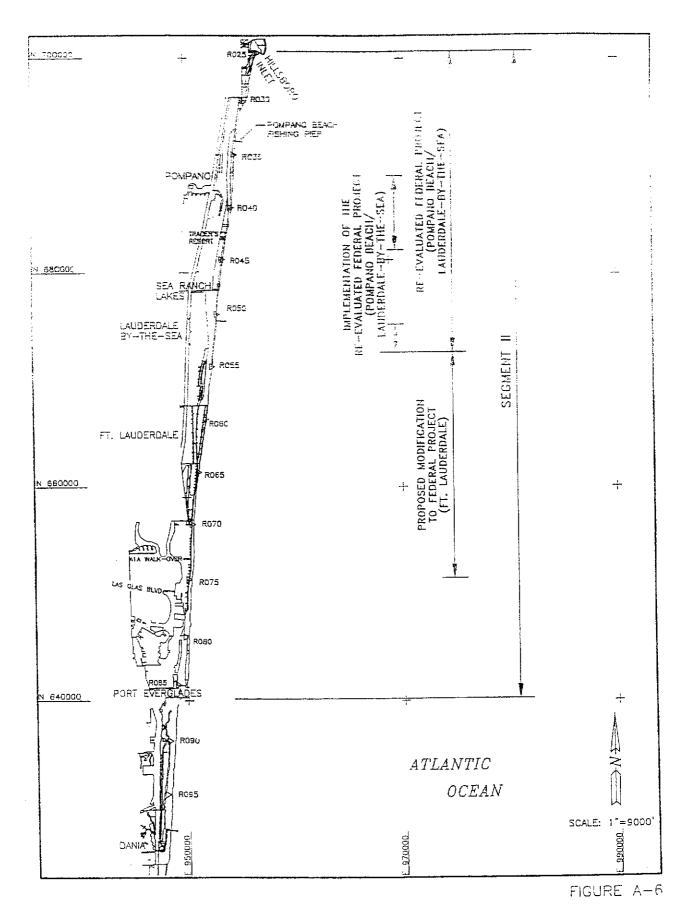
EST Recession (Ft. Lauderdale)

PROTECTIVE BEACH DESIGN AND COSTS

A-73. This section addresses the beach design and costs in terms of (1) reevaluation of the Federal project; (2) implementation of the reevaluated Federal Project; (3) a modification to the Federal project; (4) the combined reevaluated project with the modification and (5) a permittable combined project. To reevaluate the Federal project, 1970 conditions were assumed for analysis of the preliminary NED plan for Pompano Beach/Lauderdale-by-the-Sea (R26-R53). The predicted conditions in 2002 (planned construction year) were used to determine the amount of fill necessary to implement the reevaluated preliminary NED plan in Pompano Beach/Lauderdale-by-the-Sea. Ft. Lauderdale is a modification to the Federal project, so fill volumes and costs were determined based upon an independent preliminary NED plan to be constructed in 2002 along with modified reevaluated Federal project (Figure A-6).

REEVALUATION OF THE FEDERAL PROJECT (POMPANO BEACH/LAUDERDALE-BY-THE-SEA)

- A-74. <u>Project Length</u>. The Federal project extends from Hillsboro Inlet (R-26) to the south through Lauderdale-by-the-Sea (LBTS) (R53) (Figure A-6). This is a total of 5.4 miles and includes Reaches 1 and 2.
- A-75. Project Baseline. The project baseline for Pompano Beach (R-26 to R-49) is the 1970 MHW for the area from R32 to just south of R48 and the 1981 Erosion Control Line (ECL) from R26 to R32 and from R48 to R49. The ECL for LBTS (R50-53) was established as the 1983 MHW. Using these two ECLs to construct a single project will result in an inefficient, costly project. The project would have excessively large MHW extensions for LBTS, compared to Pompano Beach, which will result in adverse diffusion effects and excessive hardbottom coverage. To alleviate this problem, a baseline is used for LBTS, which is straight line extension of the Pompano Beach ECL to FDEP Monument R53. This baseline was discussed with the Jacksonville District prior to use.
- A-76. <u>Berm Elevations</u>. The authorized berm elevation for this project is +9.0 feet NGVD, which is consistent with the natural berm elevation.
- A-77. <u>Beach Widths</u>. While the beach width is optimized (NED plan) in Appendix C for the re-evaluation of the Federal project, design fill volumes, advance nourishment, hard bottom coverage, and project costs are needed for a variety of design widths. The beach widths used are in terms of ECL/baseline extensions and are from 75 feet to 125 feet in 25 foot increments.
- A-78. <u>Design Fill Volume</u>. Based on guidance provided by the National Research Council's report on beach nourishment (National Research Council, 1995), design volumes presented here are based on nourishment of the entire active profile. The design volumes are calculated using profile translation. The design volumes for the above beach widths are shown in Table A-15.



RE-EVALUTED FEDERAL PROJECT AND PROPOSED MODIFICATIONS TO THE FEDERAL PROJECT

TABLE A-15

RE-EVALUATION OF THE FEDERAL PROJECT DESIGN AND ADVANCE FILL VOLUMES AND HARD BOTTOM COVERAGE

				Hardbottom	
ECL/Baseline	Nourishment	Design	Advance Fill	Coverage	Annualized
Extension (ft)	Interval (yrs)	Fill (cy)	(cy)	(acres)	Costs
75	5	1,857,000	935,000	6.7	\$3,516,000
100	5	2,476,000	935,000	12.2	\$3,984,000
125	5	3,096,000	935,000	20.9	\$4,530,000

- A-79. Advance Nourishment. The advance nourishment needed to maintain the design width is based upon volumetric erosion rates from 1983 to 1998 (Figure A-3a). The volumetric erosion rates used to determine the amount of advance nourishment utilize only the erosive profile lines because profile accretion is not an adverse effect on maintaining the design width. The profile erosion rates are smoothed using a 3 point running average so that advance fill can be placed more uniformly to prevent adverse fill diffusion and excessive hardbottom coverage. The background erosion and end loss erosion are 15,000 cy/yr and 172,000 cy/yr, respectively.
- A-80. Since sand characteristics are not known for the beach or borrow areas used in 1970, overfill is estimated and included as a part of the design fill. The overfill ratio used applied to the design volumes is 1.15. The total advance nourishment needed for each design extension is in Table A-15 and is based on a 5 year nourishment interval. Nourishment intervals were optimized in Sub-Appendix A-2.
- A-81. <u>Hardbottom Coverage</u>. The hardbottom coverage between R26 and R53 is based upon the DOC for each beach profile line and the hardbottom communities mapped in 1999 by Broward County. The expected hardbottom coverage for each design extension is shown in Table A-15.
- A-82. <u>Project Costs</u>. Conservative price levels are used for the dredging of beachfill material. The mobilization/demobilization cost is \$1,000,000 and the unit cost of sand is \$6.50 or \$8.50/CY depending on the renourishment cycle (Table A-16). This is based on hopper dredging with rock removal. It is estimated that the unit cost of sand for the initial construction in 1970 was \$6.50/CY. For subsequent renourishments prior to the year 2000, the unit cost of sand is estimated at \$6.50/CY. The renourishment scheduled for the year 2002 will be using borrow areas that are further away from the project. Therefore, the unit price for sand is \$8.50/CY.
- A-83. Costs for project engineering and design, construction administration, maintenance, and project monitoring are estimated as a percentage of contract costs. For the initial nourishment the percentage is 10% and increases to 20% for subsequent renourishments (Table A-16). A contingency of 15% is included for all cost estimates. Table A-15 shows the annualized cost estimates for each design width used in reevaluating the Federal Project, the detailed cost estimates are shown in Sub-Appendix A-2.

Estimate of Contract and Construction Costs Pompano Beach/Lauderdale-by-the-Sea 100' Added Shoreline Width (ft) 5 Year Renourishment Interval

Project Life: 50 yrs

	Project Year	Unit Cost	Quantity					Renourishment					
Item Nourishment	0	Offit Cost	Quantity	0	5	10	15	20	25	30	35	40	45
Mobilization/Demobilization	Ü	\$1,000,000	1	\$1,000,000									
Beach Fill Beach Tilling (ac)		\$6.50 \$300	3,411,810 84.7	\$22,176,765 \$25,422									
Hard Bottom Mitigation (ac)		\$300,000	12.2	\$3,660,000									
1st Renourishment	5												
Mobilization/Demobilization Beach Fill		\$1,000,000 \$6.50	1 935,400		\$1,000,000 \$6,080,100								
Beach Tilling (ac)		\$300	84.7		\$25,422								
Hard Bottom Mitigation (ac) 2nd Renourishment	10				\$0								
Mobilization/Demobilization	10	\$1,000,000	1			\$1,000,000							
Beach Fill Beach Tilling (ac)		\$6.50 \$300	935,400 84.7			\$6,080,100 \$25,422							
Hard Bottom Mitigation (ac)		φ300	04.7			\$0							
3rd Renourishment	15	64 000 000	1				#4 000 000						
Mobilization/Demobilization Beach Fill		\$1,000,000 \$6.50	935,400				\$1,000,000 \$6,080,100						
Beach Tilling (ac)		\$300	84.7				\$25,422						
Hard Bottom Mitigation (ac) 4th Renourishment	20						\$0						
Mobilization/Demobilization	20	\$1,000,000	1					\$1,000,000					
Beach Fill Beach Tilling (ac)		\$6.50 \$300	935,400 84.7					\$6,080,100 \$25,422					
Hard Bottom Mitigation (ac)		φ500	04.7					\$0					
5th Renourishment	25	64 000 000							64 000 000				
Mobilization/Demobilization Beach Fill		\$1,000,000 \$6.50	1 935,400						\$1,000,000 \$6,080,100				
Beach Tilling (ac)		\$300	84.7						\$25,422				
Hard Bottom Mitigation (ac) 6th Renourishment	30								\$0				
Mobilization/Demobilization	00	\$1,000,000	1							\$1,000,000			
Beach Fill		\$8.50 \$300	935,400 84.7							\$7,950,900			
Beach Tilling (ac) Hard Bottom Mitigation (ac)		\$300	04.7							\$25,422 \$0			
7th Renourishment	35												
Mobilization/Demobilization Beach Fill		\$1,000,000 \$8.50	1 935,400								\$1,000,000 \$7,950,900		
Beach Tilling (ac)		\$300	84.7								\$25,422		
Hard Bottom Mitigation (ac) 8th Renourishment	40										\$0		
Mobilization/Demobilization	40	\$1,000,000	1									\$1,000,000	
Beach Fill		\$8.50	935,400									\$7,950,900	
Beach Tilling (ac) Hard Bottom Mitigation (ac)		\$300	84.7									\$25,422 \$0	
9th Renourishment	45											**	
Mobilization/Demobilization Beach Fill		\$1,000,000 \$8.50	1 935,400										\$1,000,000 \$7,950,900
Beach Tilling (ac)			84.7										
		\$300	04.7										\$25,422
Hard Bottom Mitigation (ac)		\$300	64.7										\$25,422 \$0
Hard Bottom Mitigation (ac) Subtotal			04.7	\$26,862,187	\$7,105,522	\$7,105,522	\$7,105,522	\$7,105,522	\$7,105,522	\$8,976,322	\$8,976,322	\$8,976,322	\$0 \$8,976,322
Hard Bottom Mitigation (ac) Subtotal Contingency		15%	04.7	\$4,029,328	\$1,065,828	\$1,065,828	\$1,065,828	\$1,065,828	\$1,065,828	\$1,346,448	\$1,346,448	\$1,346,448	\$0 \$8,976,322 \$1,346,448
Hard Bottom Mitigation (ac) Subtotal		15%											\$0 \$8,976,322
Hard Bottom Mitigation (ac) Subtotal Contingency Subtotal Contract Cost	Perce			\$4,029,328	\$1,065,828	\$1,065,828	\$1,065,828	\$1,065,828	\$1,065,828	\$1,346,448	\$1,346,448	\$1,346,448	\$0 \$8,976,322 \$1,346,448
Hard Bottom Mitigation (ac) Subtotal Contingency	Perce 0	15%		\$4,029,328	\$1,065,828	\$1,065,828	\$1,065,828	\$1,065,828	\$1,065,828	\$1,346,448	\$1,346,448	\$1,346,448	\$0 \$8,976,322 \$1,346,448
Hard Bottom Mitigation (ac) Subtotal Contingency Subtotal Contract Cost Nourishment E&D+S&A 1st Renourishment	Perce 0 5	15% entage of Contract 10%	Costs 1	\$4,029,328 \$30,891,515	\$1,065,828 \$8,171,351	\$1,065,828	\$1,065,828	\$1,065,828	\$1,065,828	\$1,346,448	\$1,346,448	\$1,346,448	\$0 \$8,976,322 \$1,346,448
Hard Bottom Mitigation (ac) Subtotal Contingency Subtotal Contract Cost Nourishment E&D+S&A	0	15% entage of Contract	Costs	\$4,029,328 \$30,891,515	\$1,065,828	\$1,065,828	\$1,065,828	\$1,065,828	\$1,065,828	\$1,346,448	\$1,346,448	\$1,346,448	\$0 \$8,976,322 \$1,346,448
Hard Bottom Mitigation (ac) Subtotal Contingency Subtotal Contract Cost Nourishment E&D+S&A 1st Renourishment E&O+S&A 2nd Renourishment E&O+S&A E&O+S&A	0 5 10	15% entage of Contract 10%	Costs 1	\$4,029,328 \$30,891,515	\$1,065,828 \$8,171,351	\$1,065,828	\$1,065,828	\$1,065,828	\$1,065,828	\$1,346,448	\$1,346,448	\$1,346,448	\$0 \$8,976,322 \$1,346,448
Hard Bottom Mitigation (ac) Subtotal Contingency Subtotal Contract Cost Nourishment E&D+S&A 1st Renourishment E&D+S&A 2nd Renourishment E&D+S&A 3rd Renourishment	0 5	15% Intage of Contract 10% 20%	Costs 1 1 1 1	\$4,029,328 \$30,891,515	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828	\$1,065,828	\$1,346,448	\$1,346,448	\$1,346,448	\$0 \$8,976,322 \$1,346,448
Hard Bottom Mitigation (ac) Subtotal Contingency Subtotal Contract Cost Nourishment E&D+S&A 1st Renourishment E&D+S&A 2nd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 4rd Renourishment E&D+S&A 4rd Renourishment	0 5 10	15% Intage of Contract 10% 20% 20%	Costs 1 1 1 1 1 1 1	\$4,029,328 \$30,891,515	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828	\$1,065,828 \$8,171,351	\$1,065,828	\$1,346,448	\$1,346,448	\$1,346,448	\$0 \$8,976,322 \$1,346,448
Hard Bottom Mitigation (ac) Subtotal Contingency Subtotal Contract Cost Nourishment E&D+S&A 1st Renourishment E&D+S&A 2nd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 4th Renourishment E&D+S&A 4th Renourishment E&D+S&A	0 5 10 15	15% Intage of Contract 10% 20%	Costs 1 1 1 1	\$4,029,328 \$30,891,515	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828	\$1,065,828	\$1,346,448	\$1,346,448	\$1,346,448	\$0 \$8,976,322 \$1,346,448
Hard Bottom Mitigation (ac) Subtotal Contingency Subtotal Contract Cost Nourishment E&D+S&A 1st Renourishment E&D+S&A 2nd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 4rd Renourishment E&D+S&A 4rd Renourishment	0 5 10 15	15% Intage of Contract 10% 20% 20%	Costs 1 1 1 1 1 1 1	\$4,029,328 \$30,891,515	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828	\$1,346,448	\$1,346,448	\$1,346,448	\$0 \$8,976,322 \$1,346,448
Hard Bottom Mitigation (ac) Subtotal Contingency Subtotal Contract Cost Nourishment E&D+S&A 1st Renourishment E&D+S&A 2nd Renourishment E&D+S&A 3rd Renourishment	0 5 10 15	15% ntage of Contract 10% 20% 20% 20% 20%	Costs 1 1 1 1 1 1 1 1	\$4,029,328 \$30,891,515	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,346,448 \$10,322,771	\$1,346,448	\$1,346,448	\$0 \$8,976,322 \$1,346,448
Hard Bottom Mitigation (ac) Subtotal Contingency Subtotal Contract Cost Nourishment E&D+S&A 1st Renourishment E&D+S&A 2nd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 4rd Renourishment E&D+S&A 5rd Renourishment E&D+S&A 5rd Renourishment E&D+S&A 5rd Renourishment E&D+S&A 5rd Renourishment	0 5 10 15 20 25	15% Intage of Contract 10% 20% 20% 20%	Costs 1 1 1 1	\$4,029,328 \$30,891,515	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,346,448	\$1,346,448	\$1,346,448	\$0 \$8,976,322 \$1,346,448
Hard Bottom Mitigation (ac) Subtotal Contingency Subtotal Contract Cost Nourishment E&D+S&A 1st Renourishment E&D+S&A 2nd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 4th Renourishment E&D+S&A 4th Renourishment E&D+S&A 4th Renourishment E&D+S&A 7th Renourishment E&D+S&A	0 5 10 15 20 25 30 35	15% ntage of Contract 10% 20% 20% 20% 20%	Costs 1 1 1 1 1 1 1 1	\$4,029,328 \$30,891,515	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,346,448 \$10,322,771	\$1,346,448	\$1,346,448	\$0 \$8,976,322 \$1,346,448
Hard Bottom Mitigation (ac) Subtotal Contingency Subtotal Contract Cost Subtotal Contract Cost Nourishment E&D+S&A 1st Renourishment E&D+S&A 2nd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 8rd Renourishment E&D+S&A 8th Renourishment E&D+S&A	0 5 10 15 20 25 30	15% ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	Costs 1 1 1 1 1 1 1 1 1 1 1	\$4,029,328 \$30,891,515	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,346,448 \$10,322,771	\$1,346,448 \$10,322,771	\$1,346,448 \$10,322,771	\$0 \$8,976,322 \$1,346,448
Hard Bottom Mitigation (ac) Subtotal Contingency Subtotal Contract Cost Subtotal Contract Cost Nourishment E&D+S&A 1st Renourishment E&D+S&A 2nd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 4th Renourishment E&D+S&A 4th Renourishment E&D+S&A 5th Renourishment E&D+S&A 7th Renourishment E&D+S&A 8th Renourishment E&D+S&A	0 5 10 15 20 25 30 35	15% ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	Costs 1 1 1 1 1 1 1 1 1 1 1 1	\$4,029,328 \$30,891,515	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,346,448 \$10,322,771	\$1,346,448 \$10,322,771	\$1,346,448	\$0 \$8,976,322 \$1,346,448 \$10,322,771
Hard Bottom Mitigation (ac) Subtotal Contingency Subtotal Contract Cost Nourishment E&D+S&A 1st Renourishment E&D+S&A 3rd Renourishment E&D+S&A	0 5 10 15 20 25 30 35 40	15% ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	Costs 1 1 1 1 1 1 1 1 1 1 1	\$4,029,328 \$30,891,515	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,346,448 \$10,322,771	\$1,346,448 \$10,322,771	\$1,346,448 \$10,322,771	\$0 \$8,976,322 \$1,346,448
Hard Bottom Mitigation (ac) Subtotal Contingency Subtotal Contract Cost Nourishment E&D+S&A 1st Renourishment E&D+S&A 2nd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 4th Renourishment E&D+S&A 5th Renourishment E&D+S&A 5th Renourishment E&D+S&A 5th Renourishment E&D+S&A 6th Renourishment E&D+S&A 6th Renourishment E&D+S&A 7th Renourishment E&D+S&A 7th Renourishment E&D+S&A 7th Renourishment E&D+S&A 7th Renourishment E&D+S&A 8th Renourishment E&D+S&A	0 5 10 15 20 25 30 35 40	15% ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	Costs 1 1 1 1 1 1 1 1 1 1 1 1	\$4,029,328 \$30,891,515 \$3,089,152	\$1,065,828 \$8,171,351 \$1,634,270	\$1,065,828 \$8,171,351 \$1,634,270	\$1,065,828 \$8,171,351 \$1,634,270	\$1,065,828 \$8,171,351 \$1,634,270	\$1,055,828 \$8,171,351 \$1,634,270	\$1,346,448 \$10,322,771 \$2,064,554	\$1,346,448 \$10,322,771 \$2,064,554	\$1,346,448 \$10,322,771 \$2,064,554	\$0 \$8,976,322 \$1,346,448 \$10,322,771 \$2,064,554
Hard Bottom Mitigation (ac) Subtotal Contingency Subtotal Contract Cost Subtotal Contract Cost Nourishment E&D+S&A 1st Renourishment E&D+S&A 2nd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 4th Renourishment E&D+S&A 4th Renourishment E&D+S&A 5th Renourishment E&D+S&A 7th Renourishment E&D+S&A 8th Renourishment E&D+S&A	0 5 10 15 20 25 30 35 40	15% ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	Costs 1 1 1 1 1 1 1 1 1 1 1 1	\$4,029,328 \$30,891,515 \$3,089,152 \$33,980,667	\$1,065,828 \$8,171,351 \$1,634,270 \$9,805,621	\$1,065,828 \$8,171,351 \$1,634,270 \$9,805,621	\$1,634,270 \$9,805,621	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,346,448 \$10,322,771	\$1,346,448 \$10,322,771	\$1,346,448 \$10,322,771	\$0 \$8,976,322 \$1,346,448 \$10,322,771
Hard Bottom Mitigation (ac) Subtotal Contingency Subtotal Contract Cost Nourishment E&D+S&A 1st Renourishment E&D+S&A 2nd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 4th Renourishment E&D+S&A 4th Renourishment E&D+S&A 7th Renourishment E&D+S&A 8th Renourishment E&D+S&A 9th Renourishment E&D+S&A 8th Renourishment E&D+S&A 9th Renourishment E&D+S&A 9th Renourishment E&D+S&A 1 Total Construction Cost	0 5 10 15 20 25 30 35 40	15% ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	Costs 1 1 1 1 1 1 1 1 1 1 1 1	\$4,029,328 \$30,891,515 \$3,089,152 \$33,980,667	\$1,634,270 \$1,634,270 \$9,805,621 Summary-Invest	\$1,065,828 \$8,171,351 \$1,634,270 \$9,805,621 ment and Annua	\$1,654,270 \$1,634,270 \$9,805,621	\$1,065,828 \$8,171,351 \$1,634,270 \$9,805,621	\$1,065,828 \$8,171,351 \$1,634,270 \$9,805,621 at Indicated Yea	\$1,346,448 \$10,322,771 \$2,064,554 \$12,387,325	\$1,346,448 \$10,322,771 \$2,064,554 \$12,387,325	\$1,346,448 \$10,322,771 \$2,064,554 \$12,387,325	\$0 \$8,976,322 \$1,346,448 \$10,322,771 \$2,064,554 \$12,387,325
Hard Bottom Mitigation (ac) Subtotal Contingency Subtotal Contract Cost Nourishment E&D+S&A 1st Renourishment E&D+S&A 2nd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 8rd Renourishment E&D+S&A 9rd Renourishment E&D+S&A 9rd Renourishment E&D+S&A 1rd Construction Cost	0 5 10 15 20 25 30 35 40	15% ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	Costs 1 1 1 1 1 1 1 1 1 1 1 1	\$4,029,328 \$30,891,515 \$3,089,152 \$33,980,667	\$1,665,828 \$8,171,351 \$1,634,270 \$9,805,621 Summary-Invest	\$1,065,828 \$8,171,351 \$1,634,270 \$9,805,621	\$1,634,270 \$9,805,621 Costs	\$1,055,828 \$8,171,351 \$1,634,270 \$9,805,621	\$1,055,828 \$8,171,351 \$1,634,270 \$9,805,621	\$1,346,448 \$10,322,771 \$2,064,554 \$12,387,325	\$1,346,448 \$10,322,771 \$2,064,554	\$1,346,448 \$10,322,771 \$2,064,554 \$12,387,325	\$0 \$8,976,322 \$1,346,448 \$10,322,771 \$2,064,554
Hard Bottom Mitigation (ac) Subtotal Contingency Subtotal Contract Cost Nourishment E&D+S&A 1st Renourishment E&D+S&A 2nd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 4th Renourishment E&D+S&A 4th Renourishment E&D+S&A 5th Renourishment E&D+S&A 5th Renourishment E&D+S&A 6th Renourishment E&D+S&A 7th Renourishment E&D+S&A 5th Renourishment E&D+S&A 5th Renourishment E&D+S&A 5th Renourishment E&D+S&A 7th Renourishment E&D+S&A 8th Renourishment E&D+S&A	0 5 10 15 20 25 30 35 40	15% ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	Costs 1 1 1 1 1 1 1 1 1 1 1 1	\$4,029,328 \$30,891,515 \$3,089,152 \$33,980,667	\$1,634,270 \$1,634,270 \$9,805,621 Summary-Invest	\$1,065,828 \$8,171,351 \$1,634,270 \$9,805,621 ment and Annua	\$1,634,270 \$9,805,621 15	\$1,055,828 \$8,171,351 \$1,634,270 \$9,805,621 Renourishment.	\$1,055,828 \$8,171,351 \$1,634,270 \$9,805,621 at Indicated Yea 25	\$1,346,448 \$10,322,771 \$2,064,554 \$12,387,325	\$1,346,448 \$10,322,771 \$2,064,554 \$12,387,325	\$1,346,448 \$10,322,771 \$2,064,554 \$12,387,325	\$8,976,322 \$1,346,448 \$10,322,771 \$2,064,554 \$12,387,325
Hard Bottom Mitigation (ac) Subtotal Contingency Subtotal Contract Cost Nourishment E&D+S&A 1st Renourishment E&D+S&A 2nd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 4th Renourishment E&D+S&A 4th Renourishment E&D+S&A 4th Renourishment E&D+S&A 8th Renourishment E&D+S&A 9th Renourishment E&D+S&A	0 5 10 15 20 25 30 35 40	15% ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	Costs 1 1 1 1 1 1 1 1 1 1 1 1	\$4,029,328 \$30,891,515 \$3,089,152 \$3,980,667	\$1,634,270 \$1,634,270 \$9,805,621 Summary-Invest \$9,805,621	\$1,065,828 \$8,171,351 \$1,634,270 \$9,805,621 ment and Annua 10 \$9,805,621	\$1,634,270 \$9,805,621 15 \$9,805,621	\$1,065,828 \$8,171,351 \$1,634,270 \$9,805,621 Renourishment: 	\$1,055,828 \$8,171,351 \$1,634,270 \$9,805,621 at Indicated Yea 25,805,621	\$1,346,448 \$10,322,771 \$2,064,554 \$12,387,325	\$1,346,448 \$10,322,771 \$2,064,554 \$12,387,325	\$1,346,448 \$10,322,771 \$2,064,554 \$12,387,325	\$0 \$8,976,322 \$1,346,448 \$10,322,771 \$10,322,771 \$2,064,554 \$12,387,325
Hard Bottom Mitigation (ac) Subtotal Contingency Subtotal Contract Cost Nourishment E&D+S&A 1st Renourishment E&D+S&A 2nd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 3rd Renourishment E&D+S&A 4th Renourishment E&D+S&A 4th Renourishment E&D+S&A 5th Renourishment E&D+S&A 5th Renourishment E&D+S&A 5th Renourishment E&D+S&A 7th Renourishment E&D+S&A 3th Renourishment E&D+S&A 5th Renourishment E&D+S&A 5	0 5 10 15 20 25 30 35 40	15% ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	Costs 1 1 1 1 1 1 1 1 1 1 1 1	\$4,029,328 \$30,891,515 \$3,089,152 \$33,980,667 \$33,980,667 \$178,208	\$1,634,270 \$1,634,270 \$9,805,621 \$9,805,621 \$9,805,621 \$9,805,621 \$0	\$1,065,828 \$8,171,351 \$1,634,270 \$9,805,621 ment and Annua 10 \$9,805,621 \$0	\$1,634,270 \$1,634,270 \$9,805,621 Costs 15 \$9,805,621	\$1,055,828 \$8,171,351 \$1,634,270 \$9,805,621 Renourishment. 20 \$9,805,621 \$9,805,621	\$1,055,828 \$8,171,351 \$1,634,270 \$9,805,621 at indicated Yea 25 \$9,805,621 \$0,805,621	\$1,346,448 \$10,322,771 \$2,064,554 \$12,387,325 \$12,387,325 \$0 \$12,387,325	\$1,346,448 \$10,322,771 \$2,064,554 \$12,387,325 \$12,387,325 \$12,387,325	\$1,346,448 \$10,322,771 \$2,064,554 \$12,387,325 \$40 \$12,387,325 \$0	\$0 \$8,976,322 \$1,346,448 \$10,322,771 \$2,064,554 \$12,387,325 \$12,387,325 \$12,387,325

- A-84. Based upon economic considerations, an ECL extension of 100 feet, the preliminary NED plan, was found to provide the optimum difference between annualized project costs and primary benefits. The NED plan was calculated using 1970 conditions, but under present conditions there is already sufficient beach width in some areas to maintain the preliminary NED plan width through the next expected nourishment interval. The only two areas within the Federal project which would require renourishment are from R-37 to R-42 and R-52 to R53 (Plates 1-7). Table A-17 shows the proposed beach extension, including advance nourishment, from the 1998 MHW. The preliminary NED design width is a 100 foot ECL/baseline extension (Appendix C).
- A-85. <u>Design Fill Volume</u>. Based on guidance provided by the National Research Council's report on beach nourishment (National Research Council, 1995), design volumes presented here are based on nourishment of the entire active profile. The design volumes include 77,220 cy to restore and translate the profile. The design volume also takes into account the amount of material that is expected to be lost from 1998 to 2002 which is 39,900 cy. The design volumes for each profile are shown in Table A-17.
- A-86. Advance Nourishment. The advance nourishment needed to maintain the design width is based upon the volumetric erosion rates from 1983 to 1998 (Figure A-3a). The volumetric erosion rates used to determined the amount of advance nourishment utilize only the erosive profile lines, because profile accretion is not an adverse effect on maintaining the design width. The profile erosion rates are smoothed, using a 3 point running average, so that advance fill can be placed more uniformly to prevent adverse diffusion and excessive hardbottom coverage. For the two fill areas, the background erosion rate is 13,200 cv/yr.
- A-87. The advance nourishment also takes into account the amount of fill needed to maintain the design width through the 10-year renourishment interval as a result of diffusive end losses. Project diffusion is based upon the design's planform response to the wave climate (Campbell et al., 1992). The portion of the advance nourishment that is for project diffusion is 106,500 cy. Due to the compatibility of the borrow material to the existing beach material, no overfill is necessary. The total advance nourishment needed is 239,000 cy. (Table A-17).
- A-88. <u>Fill Volume Behind ECL</u>. For the Federal project, only fill in Lauderdale-by-the-Sea will be placed behind the ECL. The total amount of fill behind the ECL is 9,100 cy (Table A-17).
- A-89. <u>Hardbottom Coverage</u>. The hardbottom coverage is based upon the DOC for each beach profile line, the expected profile response, and the hardbottom location mapped in 1999 by

Table A-17

Pompano Beach/Lauderdale-by-the-Sea
Beach Extensions, Fill Volumes, and Hardbottom Coverage
To Implement Preliminary NED Plan in 2002

Monument	Effective Distance (ft)	MHW Extension (including Adv. Fill) (ft)	Design Volume (CY)	Advance Fill (CY)	Fill Behind ECL (CY)	Hardbottom Coverage (acres)
R-36	1,016	0.0	0	0	0	0.0
R-37	915	40.9	4,108	33,273	0	0.9
R-38	948	70.1	18,044	39,913	0	1.7
R-39	1,005	69.9	19,587	39,673	0	0.0
R-40	971	59.6	18,597	33,904	0	1.7
R-41	942	40.4	1,062	31,027	0	0.0
T-42	1,015	38.0	6,957	23,446	0	0.4
R-43	930	0.0	0	0	0	0.0
R-44	1,001	0.0	0	0	0	0.0
R-45	1,044	0.0	0	0	0	0.0
CR-46	789	0.0	0	0	0	0.0
R-47	972	0.0	0	0	0	0.0
R-48	1,205	0.0	0	0	0	0.0
R-49	1,129	0.0	0	0	0	0.0
R-50	1,000	0.0	0	0	0	0.0
R-51	973	0.0	0	0	0	0.0
T-52	967	31.9	24,340	9,094	5,520	1.1
R-53	978	60.0	24,441	28,621	3,605	0.5
Total	17,800		117,137	238,951	9,125	6.4

Broward County. The total coverage for Pompano Beach/Lauderdale-by-the-Sea is 6.4 acres (Table A-17).

- A-90. <u>Project Costs</u>. Costs were determined to implement the preliminary NED plan width of a 100 foot ECL extension under present conditions. The total costs to build and maintain this preliminary NED plan for 18 years, the remainder of the 50 year project life, are adjusted to present value then amortized over 18 years. The costs to maintain the project include one renourishment 10 years after construction. The interest rate used is 6.125%. The annualized cost for this modification to the reevaluated Federal project is \$967,000 (Table A-18).
- A-91. Conservative price levels are used for the dredging of material. The mobilization/demobilization cost is \$1,000,000 and the unit cost of sand is \$8.50/CY. The dredging costs are based on the current market, account for dredging during the winter season, and filtering of dredged material. There are adequate sediment reserves (Appendix E) to assume constant unit price levels.
- A-92. A contingency of 15% is included for all cost estimates. Costs to perform geotechnical investigations; secure easements; perform environmental monitoring; and engineering, design, construction supervision, and administration are shown in Table A-18. Sand production is estimated at 300,000 cy/month.

MODIFICATION TO THE FEDERAL PROJECT (FT. LAUDERDALE)

- A-93. A recommended plan is presented here as a modification to the Federal project. Ft. Lauderdale has never been nourished and it is recommended that it be made a part of the Federal project. A detailed description of this recommendation is presented below and shown in Plates 7–14. The design and costs for the optimization of Ft. Lauderdale modification are presented.
- A-94. <u>Project Length</u>. Approximately 4.0 miles of Ft. Lauderdale's 5.9 mile shoreline are erosional and initially considered for nourishment (Table A-6). Areas south of R-74 are mildly accretional. The north limit of the proposed beach fill is located at FDEP monument R-53. The southern limit of the renourishment area is defined as R-74.
- A-95. <u>Taper Section</u>. The south end of the proposed fill will require a 4,000 foot taper section beginning at R-74. The north end of this modification to the Federal Project will transition into the existing Federal Project at Lauderdale-by-the-Sea (R-53). The taper section was optimized using the guidance described in CETN-II-6 (USACE, 1982). The optimization is based on the transition length to the construction template, annual cost of renourishment, and annualized cost of the transition. Renourishment intervals of 10 and 11 years were used and the advance nourishment quantities used are described in a following section. Increments of 1000 feet were used. Table A-19 shows the annualized costs for various taper lengths. The 4,000 foot taper is optimal.

TABLE A-18

Estimate of Contract and Construction Costs
Pompano Beach to Lauderdale-by-the-Sea
100' Added Shoreline Width (ft)
Renourishment Interval: 10 yrs
Project Life: 18 yrs

ltem	Project Year	Unit Cost	Quantity	Renourishment 2002	Renourishment at Indicated Year 2002
Mobilization Reach 2 Beach Fill (cy)	0	\$1,000,000 \$8.50	1 356,088	\$1,000,000 \$3,026,746	\$1,000,000
	10	\$8.50	212,456		\$1,805,873
Beach Tilling (ac)		\$300	17.8	\$5,331	\$5,331
Hard Bottom Mitigation (ac)		\$300,000	6.4	\$1,919,653	
Subtotal				\$5,951,730	\$2,811,205
Contingency		15%		\$892,760	\$421,681
Subtotal Contract Cost				\$6,844,490	\$3,232,885
Geotechnical Investigations		107,203	~	\$107,203	\$107,203
Secure Easements		125,000	-	\$125,000	
Environmental Monitoring		155,207	-	\$155,207	\$155,207
E&D+S&A		757,193	÷=	\$757,193	\$757,193
Total Construction Cost				\$7,989,093	\$4,252,488
	Summary-Inves	Summary-Investment and Annual Costs	al Costs		
Item				Renourishment	Renourishment at Indicated Year
				2002	2012
Construction Cost				\$7,989,093	\$4,252,488
Interest During Construction				\$39,873	\$0
Total Investment Cost				\$8,028,965	\$4,252,488
Present Worth of Each Construction				\$8,028,965	\$2,346,746
Total Present Worth				\$10,375,71	75,711

Average Annual Cost	\$967,279
Interest Rate	6.125%

TABLE A-19

MODIFICATION TO THE FEDERAL PROJECT OPTIMIZATION OF TAPER LENGTH

Taper Length	Annualized Costs	Annualized Costs
(feet)	10 Year	11 Year
2,000	\$767,000	\$750,000
3,000	\$645,000	\$624,000
4,000	\$624,000	\$598,000
5,000	\$643,000	\$612,000
6,000	\$682,000	\$647,000
7,000	\$733,000	\$693,000

Note: Least cost alternative shown in bold.

A-96. A non-federal preferred option of a 1,000 foot taper will be exercised when implementing the project. A 4,000 foot taper will cover an acre of additional hard bottom, which results in increased mitigation costs. The difference in sand volume between the 1,000 foot taper and 4,000 foot taper has been included in the advance nourishment. Using the 1000 foot taper while placing the 4,000 foot taper volume within the project limits will minimize hardbottom impacts while maintaining project integrity.

A-97. <u>Project Baseline</u>. Since an ECL has not been established, the 1998 MHW (+1.9 feet NGVD) will be used as the project baseline.

A-98. <u>Berm Elevations</u>. The authorized berm elevation for this project is +9.0 feet NGVD, which is consistent with the natural berm elevation.

A-99. <u>Beach Widths</u>. While the beach width is optimized (preliminary NED plan) in Appendix C for this modification to the Federal project, design fill volumes, advance nourishment, hard bottom coverage, and project costs are needed for a variety of design widths. The beach widths used are in terms of baseline extensions and are from 1 foot to 50 feet in 25 foot increments. The preliminary NED plan for this modification was found to be a 25 foot extension of the baseline (Appendix C).

A-100. <u>Design Fill Volume</u>. Based on guidance provided by the National Research Council's report on beach nourishment (National Research Council, 1995), design volumes presented here are based on nourishment of the entire active profile. The design volumes are calculated using profile translation. Included in the design volume is 75,500 cy to account for 1998-2002 expected erosion. The design volumes for the above beach widths are shown in Table A-20.

TABLE A-20 MODIFICATION TO THE FEDERAL PROJECT FILL VOLUMES AND HARD BOTTOM COVERAGE

ECL/	South	Nourishment	Design	Advance	Fill	Hardbottom	Annualized
Baseline	Project	Interval	Fill (cy)	Fill	Behind	Coverage	Cost
Extension	Limit	(yrs)	-	(cy)	Baseline	(acres)	
(ft)		-		-	(cy)		
1	R-74	12	120,700	383,300	189,400	4.0	\$1,016,000
25	R-74	11	556,400	364,400	189,400	6.5	\$1,574,000
50	R-74	10	1,010,200	345,500	189,400	10.4	\$2,202,000
25	R-79	12	670,600	422,800	237,500	14.4	\$2,037,000
25	R-84	12	768,700	457,300	278,700	15.3	\$2,231,000

- A-101. Advance Nourishment. The advance nourishment needed to maintain the design width is based upon volumetric erosion rates from 1993 to 1998 (Figure A-3b). The volumetric erosion rates used to determine the amount of advance nourishment utilize only the erosive profile lines because profile accretion is not an adverse effect on maintaining the design width. The profile erosion rates are smoothed, using a 3 point running average, so that advance fill can be placed more uniformly to prevent adverse diffusion and excessive hardbottom coverage. The advanced nourishment rate is 18,900 cy/yr. The advance nourishment necessary for the project also takes into account the diffusive end losses. The diffusion for the R53-R74 project (127,100 cy) includes the volume for a 4,000 foot taper. Project diffusion is based upon the design's planform response to the wave climate (Campbell et al., 1992).
- A-102. Cost tables verifying optimal intervals are shown in Sub-Appendix A-3. Based upon the different sand characteristics between the existing beach and the borrow material, addressed in a previous section of this appendix, the overfill needed for this modification to the Federal project is 30,000 cy (1.4 cy/ft) for the R53 to R74 project.
- A-103. <u>Fill Volume Behind Baseline</u>. The total amount of fill behind the baseline is 189,400 cy (Table A-20) for the R53-R74 project.
- A-104. <u>Hardbottom Coverage</u>. The hardbottom coverage is based upon the DOC for each beach profile line and the hardbottom location mapped in 1999 by Broward County. The total coverage for Ft. Lauderdale is 6.5 acres (Table A-20) for the 25 foot wide, 11 year interval, project.
- A-105. <u>Project Costs</u>. Conservative price levels are used for the dredging of material. Since this modification is being evaluated independently of the Pompano/Lauderdale-by-the-Sea project, the mobilization/demobilization cost is \$1,000,000. Since Ft. Lauderdale is further away from the borrow areas, the hopper dredge will have longer distances to travel. Consequently, the unit cost of sand is \$9.00/CY. The dredging costs are based on the current market, account for dredging during the winter season, and filtering of dredged material. There are adequate

sediment reserves (Appendix E) to assume constant unit price levels. A contingency of 15% is added to any contract cost.

A-106. Costs for project engineering and design, construction administration, maintenance, and project monitoring are estimated as a percentage of contract costs. For initial nourishment the E&D and S&A percentage is 10% and increases to 20% for the subsequent renourishment (Table A-21). A contingency of 15% is included for all cost estimates. Sand production is estimated at 300,000 cy/month. Detailed cost estimates for each design width are shown in Sub-Appendix A-3, but are summarized in Table A-20. Appendix C determines that the 25 foot width project is the optimal project.

BEACH LENGTHS

A-107. As discussed previously, the existing beach is erosional from R53 through R-74 in Ft. Lauderdale; therefore, if sufficient benefits exist (Appendix C), this is the minimum length of beach that should be constructed. To determine the optimal length (preliminary NED plan) additional lengths were considered with 5,000 foot increments. The maximum length considered extends to the north jetty at Port Everglades. The design parameters and costs are summarized in Table A-20. Hardbottom coverages for each length of project are also shown. Optimization of the intervals is shown in Appendix A-4. Optimization of the project length, discussed in Appendix C, indicates that the R-53 to R-74 project is the preliminary NED length. Hardbottom impacts are also minimized.

COMBINED REEVALUATED AND MODIFIED FEDERAL PROJECT

A-108. The total cost of the reevaluated Pompano Beach/Lauderdale-by-the-Sea project over a 50-year life and the Ft. Lauderdale project over a 18-year life is shown in Table A-22. This analysis combines the project costs at the individual optimal nourishment intervals. The annual cost of the preliminary NED plan is \$4,146,000.

IMPLEMENTATION OF THE COMBINED REEVALUATED FEDERAL PROJECT

A-109. While the previous section presented the costs for the project over a 50-year life, implementation of the project will occur over the remaining 18 years of the authorized life. There are opportunities for cost saving through shared mobilization efforts and identifying a combined nourishment interval. It should be noted, that due to the change in nourishment interval, the hardbottom coverage reduces to 6.4 and 6.4 acres, for Pompano Beach/Lauderdale-by-the-Sea and Ft. Lauderdale, respectively. Based upon the annualized costs of the recommended modified, reevaluated Federal project, the optimum renourishment interval is 10 years, with an annualized cost of \$2,355,000 (Table A-23). Detailed cost estimates for various nourishment intervals are shown in Sub-Appendix A-5. The renourishment interval was determined using the fill volume and costs estimates, to implement the preliminary NED plans for both Pompano Beach/Lauderdale-by-the-Sea (100 foot extension of the ECL/baseline) and Ft. Lauderdale (25 foot baseline extension). These volume calculations and cost estimates were addressed in previous sections of this appendix. The annualized cost for each renourishment interval is shown in Table A-24, and detailed cost tables are shown in Sub-Appendix A-5.

Estimate of Contract and Construction Costs Ft Lauderdale

25' Added Shoreline Width (ft) to R-74 Renourishment Interval: 11 yrs

Project Life: 18 years

Item	Project Year	Unit Cost	Quantity	Renourishment a	t Indicated Year 2013
Mobilization		\$1,000,000	1	\$1,000,000	\$1,000,000
Reach 3 Beach Fill (cy)	0	\$9.00	920,780	\$8,287,023	
	11	\$9.00	288,850		\$2,599,646
Beach Tilling (ac)		\$300	12.1	\$3,635	\$3,635
Hard Bottom Mitigation (ac)		\$300,000	6.5	\$1,953,293	
Subtotal				\$11,243,951	\$3,603,282
Contingency		15%		\$1,686,593	\$540,492
Subtotal Contract Cost				\$12,930,544	\$4,143,774
Nourishment					
E&D+S&A		10%	1	\$1,293,054	
1st Renourishment					
E&D+S&A		20%	1		\$828,755
Total Construction Cost				\$14,223,598	\$4,972,528
	Summary-Invest	ment and Annual	Costs		
Item				Renourishment a	t Indicated Year
				2002	2013
Construction Cost				\$14,223,598	\$4,972,528
Interest During Construction				\$71,696	\$0
Total Investment Cost				\$14,295,294	\$4,972,528
Present Worth of Each Construction				\$14,295,294	\$2,585,726
Total Present Worth				\$16,88	31,020

Average Annual Cost	\$1,573,739
Interest Rate	6.125%

P:\Broward\535056 Federal Design Document Revisions\Engineering_Appx_A\[Table-A21-optimized interval-FLL-rev.xls]11 yrs (2) 2/18/2002 1:16 PM

Estimate of Contract and Construction Costs Pompano Beach/Lauderdale-by-the-Sea and Ft. Lauderdale 100'/25' Added Shoreline Width (ft) 5/11 Year Renourishment Interval

Project Life: 50 yrs

ltem Yournshment	Project Year	Unit Cost	Quantity	1970	:975	1980	1985	1989	1995	at indicated Yea 2000	2002	2005	2010	2013	2015
Mobilization/Demobilization	·	\$1,000,000	1	\$1,000,000											
Beach Fill Beach Tilling (ac)		\$6.50	3,411,810 84.7	\$22,176,765 \$25,422											
Hard Bottom Miligation (ac)		2300,000	12.2	\$3,660,000											
i Renourshment	5														
Mobilization/Demobilization Beach Fill		\$1,000,000 \$6.50	f 935,400		\$1,000,000 \$6,080,100										
Beach Tilling (ac)		\$300	64.7		525,422										
Hard Bottom Mitigation (ac) ng Renourshment	10				\$0										
Mobilization/Demobilization	10	\$1,000,000	1			\$1,000,000									
Beach Fill		\$6.50	935,400			\$6,080,100									
Beach Tilling (ac) Hard Bottom Mrsgation (ac)		\$300	84 7			\$25,422 \$0									
d Renourshment	15					•-									
Mobilization/Demobilization		\$1,000,000 \$6,50	1 935,400				\$1,000,000 \$6,030,100								
Beach Tilling (sc)		\$300	84.7				\$25.422								
Hard Bottom Misgation (ac) in Renourishment	20						\$0								
Mobilization/Demobilization	20	\$1,000,000	1					\$1,000 000							
Beach Fill Beach Tilling (ac)		\$6.50	935,400					\$6.080.100							
Hard Bottom Mitigation (ac)		\$300	84 7					\$25,422 \$0							
h Renounshment	25			İ											
Mobilization/Demobilization Seach Fill		\$1,000,000 \$6.50	1 935,400						\$1,000,000						
Seech Tilking (ac)		\$300	84 7						\$6,080,100 \$25,422						
Hard Boltom Mitigation (ac)				1					\$0						
h Renounshment Mobilization/Damob lization	30	\$1,000,000	,	!						\$1,000,000					
Seach Fill		\$8.50	935,400							57,950,900					
Beach Tilling (ac) Herd Bottom Mitigation (ac)		\$300	84.7							\$25,422					
Ih Rengunshment	35			:						50					
Mobilization/Demobilization		\$1,000,000	1									\$1,000,000			
Seach Fill Seach Tilling (ac)		\$300 \$300	935,400 84.7									\$7.950,900 \$25,422			
Hard Bottom Mitigation (ac)		****	4									\$0			
lih Renoutlahment Mobilization/Damobilization	40	#4 oon oon													
Seach Fill		\$1,000,000 \$8.50	935,400										\$1,000,000 \$7,950,900		
Seach Tilling (ac)		\$300	84,7										\$25.422		
Hard Bottom Mitigation (ac) h Resourchment	45												. 50		
Mobilization/Demobilization		\$1,000,000	1.												\$1,000,000
Beach Fill Beach Tilkng (ac)		\$8.50 \$300	935,400 84 7												\$7,950,900 \$25,422
Haud Bottem Mitigation (ac)		3300	041												\$25,422
ddition of FI Lauderdale															•
Mobilization/Damobilization	32.	\$1,000,000		İ							\$1,000,000				
Besch Fill		\$9.00	920,780								\$8,287,023				
Beach Tilling (ac) Hard Bottom Mitigation (ac)		\$300,000	12.1 8.5								\$3,635				
Innourishment Ft Lauderdale	43	4004,000	• • • • • • • • • • • • • • • • • • • •								\$1,953,293				
Mobilization/Damob-lization Beach Fill		\$1,000,000 \$9.00	1											\$1,000,000	
Beach Tilking (ac)		\$300	286,850 12 1											\$2,589.645 \$3,635	
Hard Bottom Mitigation (ac)														\$0	
Subtotal				\$26.662,187	\$7.105.622	\$7,105,522	\$7,105,522	\$7,105,522	\$7,105,522	\$5,976,322	\$11,243,951	\$8,976.322	\$8,976,322	\$3,603,282	\$6,976,322
Contingency		15%		\$4,029,328	\$1.065.628	\$1,065,828	\$1,085,828	\$1,065,828	\$1,085,828	\$1,346,448	\$1,686.593	51,346 448	\$1,346,448	\$540,492	\$1,348.445
Subtotal Contract Cont				\$30.691.515	\$8.171.351	\$8,171,351	\$8,171,351	\$8,171,351	\$8.171,351	\$10.322.771	\$12,930,544	\$10,322,771	\$10,322.771	\$4.143.774	\$10,322,771
	Perce	entage of Contract	Conta												
fourishment E&D+S&A	0	10%	1	\$3,089,152											
st Renounshment	5	1076		\$3,U89,132											
E&D+S&A		20%	1		\$1.834.270										
nd Renourishment E&D+S&A	10	20%				\$1,634,270									
rd Renounshment	15					41,004,210									
EAD+S&A th Renowishment	20	20%	1				\$1,634,270								
E&D+S&A		20%	1					\$1,634,270							
A Renourishment	25							,	4						
E&D+S&A 5 Renounshment	30	20%	1						\$1.634.270						
E&D+S&A		20%	1							\$2,064,554					
Renounshment E6D+S&A	35	now.	1									to or :			
h Regounshment	40	20%	1									\$2,084.554			
E&D+5&A		20%	1										\$2,064,554		
h Renounshment E&D+S&A	45	20%	1												2.064.554
		FA.30	,												2.004.054
tokon of Ft Lauderdale E&D+S&A	32														
ESD+S&A II Renourishmeni	43	10%	1								\$1,293,064				
E5D+S&A	-	20%	1											\$828,755	
Total Construction Cost				\$33,880,567	\$9,805,521	59.805.621	\$9,805,621	\$9,305,621	\$9,805,621	E12307325	\$41.222.500	C13 3P7 205	tro get age	\$4 p72 see	£12.597.00
roam commutation cost				335,830,807	49,000,021	33,003,621	\$2,0u0,02)	48,000,621	\$8,0V\$,821	a12,387,325	\$14,223,596	\$12.387,325	a*Z,347,325	\$4,972,528	\$12,387,32
					5	Summary-Investr	ment and Annual	Costs							
Item				· · · ·					Renourishment	at Indicated Yes	,				
onstruction Cost				1973 \$33,980,667	1975 \$9,805,821	1980 \$9.835.621	1855 \$9.805,621	1990	1995	2000 \$12,387,325	2002	2005	2013	2013	2015
erre well-det special				\$33,980,667 \$178,208	\$9,805,621 \$0	\$9.805.621 \$0	\$9.805,621 \$0	\$9,805,621 \$0	\$9,805,621 \$0	\$12,387,325 \$0	\$14,223,698 \$71,696	\$12,367,325 \$0	\$12,387,325 \$0	54,972,528 50	\$12,387,32: \$0
terest Buring Construction				1											
tul Investment Cost				\$34,158,874	\$9,805,821	\$9.505.621	\$6,805,621	\$9,805,621	59,805,621		\$14,295,294	\$12 387,325	512,387,325	54,972,528	
otal Investment Cost resent Worth of Each Construction otal Present Worth				\$34,158,874 \$34,158,874	\$9,805,821 \$7,284,279	\$9.605 621 \$5,411 256	\$9,805,621 \$4,019,847	\$9,805,621 \$2,986,215	\$2.218.362	\$12,387,325 \$2,081,836 26,542	\$14,295,294 \$2 133,175	\$12 387,325 \$1,546,528	\$12,387,325 \$1,148,866	\$4,972,528 \$386,548	\$12,337,32 \$653 455

Average Annual Coat \$4,145,208 Interest Rate 6,126%

Estimate of Contract and Construction Costs Segment II

100'/25' Added Shoreline Width (ft) Renourishment Interval: 10 yrs

Project Life: 18 yrs

				Donouriohmont	at Indicated Year
Item	Project Year	Unit Cost	Quantity	2002	2012
Mobilization		\$1,100,000	1	\$1,100,000	\$1,100,000
Reach 2 Beach Fill (cy)	0	\$8.50	356,088	\$3,026,746	, , ,
, .,	10	\$8.50	212,456		\$1,805,873
Reach 3 Beach Fill (cy)	0	\$9.00	901,893	\$8,117,037	
	10	\$9.00	307,737		\$2,769,633
Beach Tilling (ac)		\$300	29.9	\$8,966	\$8,966
Hard Bottom Mitigation (ac)		\$300,000	12.8	\$3,829,062	
Subtotal				\$16,081,811	\$5,684,472
Contingency		15%		\$2,412,272	\$852,671
Subtotal Contract Cost				\$18,494,083	\$6,537,143
		100.000		# 400.000	0.100.000
Geotechnical Investigations		190,000	1	\$190,000	\$190,000
Secure Easements		250,000	1	\$250,000	4075 070
Environmental Monitoring		275,079	1	\$275,079	\$275,079
E&D+S&A		1,342,000	1	\$1,342,000	\$1,342,000
Total Construction Cost				\$20,551,162	\$8,344,222
	Summary-Inves	tment and Annua	al Costs		
	Cummary mires		000.0		
Item				Renourishment a	at Indicated Year 2012
Construction Cost				\$20,551,162	\$8,344,222
Interest During Construction				\$104,105	\$0
Total Investment Cost				\$20,655,267	\$8,344,222
Present Worth of Each Construction				\$20,655,267	\$4,604,779
Total Present Worth				\$25,20	60,046

Average Annual Cost	\$2,354,877
Interest Rate	6.125%

TABLE A-24 RENOURISHMENT INTERVAL OPTIMIZATION FOR THE IMPLEMENTATION OF THE RE-EVALUATED FEDERAL PROJECT

Nourishment Interval (Years)	Project Costs
9	\$2,356,000
10	\$2,355,000
11	\$2,358,000
12	\$2,364,000
13	\$2,373,000
14	\$2,385,000
15	\$2,400,000

Note: Least cost alternative shown in bold.

A-110. The preliminary NED plan was reviewed with the State of Florida and Federal resource agencies to determine if the plan was permittable. After consultation with those agencies, it was determined that the preliminary NED plan was not permittable due to excessive equilibrium toe of fill impacts, but with some modifications to avoid impacts to nearshore hardbottoms and avoid potential impacts to hardbottoms adjacent to the borrow areas, the plan could be permittable. The modifications generally include the following:

- a. A reduction in the advanced nourishment volume between R-36 and R-42.
- b. A reduction in the advanced nourishment volume between R-51 and R-71.
- c. A reduction in the Ft. Lauderdale design width from 25 feet to 20 feet.
- d. A shortening of the project length from R-74 to R-71 (about 3000 feet).
- e. Elimination of Borrow Area V and VII (Appendix E).
- f. Modification of the other borrow areas, as needed, to increase the distance from the borrow area to specific hardbottom resources (Appendix E).

A-111. The total beach fill in northern Pompano Beach (R-36 to R-42) was reduced to 198,000 cy. Based on 2001 beach profiles, approximately 26,000 cy is required to restore the 100 foot design section. The remaining 172,000 cy will provide 6 years of advanced nourishment accounting for background erosion, end losses and overfill. Approximately 3.0 acres of nearshore hardbottom will be impacted by the equilibrium toe of fill. The cost of implementing this 6 year nourishment interval for the remaining 18 years of project life is shown in Table A-25. The annual cost is \$1,094,000. This is the NED plan for Pompano Beach/Lauderdale-By-The-Sea.

A-112. The Ft. Lauderdale segment (R-53 to R-71 with tapers to adjacent beaches) was reduced to 732,000 cy. This required a reduction of the design section from 25 feet to 20 feet (extension of the 1998 shoreline). Based on the 2001 beach profiles approximately 476,000 cy is required to establish the design section. The remaining 256,000 cy will provide 6 years of advanced nourishment for background erosion, end losses and overfill. Approximately 3.0 acres of

Estimate of Contract and Construction Costs Pompano Beach/Lauderdale-by-the-Sea 100' Added Shoreline Width (ft) 6 Year Renourishment Interval Project Life: 18 yrs

Item	Project	Unit Cost	Quantity	Renourist 2002	nment at Indica 2008	ted Year 2014
Nourishment	Year 0			2002	2006	2014
Mobilization/Demobilization	U	\$1,000,000	1	\$1,000,000		
Beach Fill		\$8.50	198,000	\$1,683,000		
		*	•			
Beach Tilling (ac)		\$300	26.0	\$7,800		
Hard Bottom Mitigation (ac)	•	\$300,000	3.0	\$900,000		
1st Renourishment	6	# 4 000 000			# 4 000 000	
Mobilization/Demobilization		\$1,000,000	1		\$1,000,000	
Beach Fill		\$8.50	171,000		\$1,453,500	
Beach Tilling (ac)		\$300	22.0		\$6,600	
Hard Bottom Mitigation (ac)			0.0		\$0	
2nd Renourishment	12					
Mobilization/Demobilization		\$1,000,000	1			\$1,000,000
Beach Fill		\$8.50	171,000			\$1,453,500
Beach Tilling (ac)		\$300	22.0			\$6,600
Hard Bottom Mitigation (ac)			0.0			\$0
Subtotal				\$3,590,800	\$2,460,100	\$2,460,100
Contingency		15%		\$538,620	\$369,015	\$369,015
Subtotal Contract Cost		1070		\$4,129,420	\$2,829,115	\$2,829,115
Subtotal Sollinate Soci				ψ1,120,120	Ψ2,020,110	Ψ2,020,110
	Percer	tage of Contrac	t Costs			
Nourishment	0					
Geotechnical Investigations		\$190,000	1	\$190,000		
Secure Easements		\$250,000	1	\$250,000		
Environmental Monitoring		\$275,079	1	\$275,079		
E&D+S&A		\$1,342,000	1	\$1,342,000		
1st Renourishment	6					
Geotechnical Investigations		\$190,000	1		\$190,000	
Environmental Monitoring		\$275,079	1		\$275,079	
E&D+S&A		\$1,342,000	1		\$1,342,000	
2nd Renourishment	12					
Geotechnical Investigations		\$190,000	1			\$190,000
Environmental Monitoring		\$275,079	1			\$275,079
E&D+S&A		\$1,342,000	1			\$1,342,000
Total Construction Cost				\$6,186,499	\$4,636,194	\$4,636,194
	Summ	ary-Investment	and Annual			
				_		
Item					nment at Indica	
Construction Cost				2002 \$6,186,499	2008 \$4,636,194	2014 \$4,636,194
Interest During Construction				\$31,577	\$4,030,194 \$0	\$4,636,194
interest During Construction				φυτ,υττ	φυ	φυ
Total Investment Cost				\$6,218,076	\$4,636,194	\$4,636,194
Present Worth of Each Constructio	n			\$6,218,076	\$3,245,304	\$2,271,690
Total Present Worth			<u> </u>		\$11,735,070	<u> </u>

Average Annual Cost	\$1,094,006
Interest Rate	6.125%

nearshore hardbottom will be impacted by the equilibrium toe of fill. The cost of implementing the 6 year interval for the remaining 18 years of project life is shown in Table A-26. The annual cost is \$1,287,000. This is the NED plan for Ft. Lauderdale. The total cost of the reevaluated Pompano Beach/Lauderdale-by-the-Sea project over a 50-year life and the (20 foot) NED plan for the Ft. Lauderdale project over an 18-year life is shown in Table A-27.

A-113. As the Pompano/LBTS reach and Ft. Lauderdale reach will be concurrently constructed, a combine cost estimate is shown in Table A-28. The annual cost to implement the Segment II NED plan for the remainder of the authorized life (18 years) is \$2,228,000.

SUMMARY OF PROJECT COSTS

A-114. A summary of the project costs for the development and implementation of the Segment II project is provided in Table A-29.

ECONOMIC UPDATE OF PROJECT COSTS

A-115. The NED plan was updated to reflect a change in the interest rate (5.875 percent) and the cost of nearshore hardbottom mitigation. Table A-30 shows the annual cost of the NED plan to be \$4,449,000.

Estimate of Contract and Construction Costs

Ft. Lauderdale

20' Added Shoreline Width (ft)

6 Year Renourishment Interval

Project Life: 18 yrs

Item	Project	Unit Cost	Quantity	Renourish	ment at Indica	ted Year
	Year	———	Quantity	2002	2008	2014
Nourishment	0			-		
Mobilization/Demobilization		\$100,000	1	\$100,000		
Beach Fill		\$9.00	737,000	\$6,633,000		
Beach Tilling (ac)		\$300	69.0	\$20,700		
Hard Bottom Mitigation (ac)		\$300,000	3.0	\$900,000		
1st Renourishment	6					
Mobilization/Demobilization		\$100,000	1		\$100,000	
Beach Fill		\$9.00	257,000		\$2,313,000	
Beach Tilling (ac)		\$300	24.0		\$7,200	
Hard Bottom Mitigation (ac)			0.0		\$0	
2nd Renourishment	12				·	
Mobilization/Demobilization		\$100,000	1			\$100,000
Beach Fill		\$9.00	257,000			\$2,313,000
Beach Tilling (ac)		\$300	24.0			\$7,200
Hard Bottom Mitigation (ac)		•	0.0			\$0
Subtotal		<u> </u>		\$7,653,700	\$2,420,200	\$2,420,200
Contingency		15%		\$1,148,055	\$363,030	\$363,030
Subtotal Contract Cost				\$8,801,755	\$2,783,230	\$2,783,230
	Percent	tage of Contrac	ct Costs			
Nourishment	0	J				
E&D+S&A		10%		\$880,176		
1st Renourishment	6			, , , , , ,		
E&D+S&A		20%			\$556,646	
2nd Renourishment	12				¥===,± :•	
E&D+S&A		. 20%				\$556,646
Total Construction Cost				\$9,681,931	\$3,339,876	\$3,339,876
	Summa	ary-Investment	and Annual	Costs	· - ·	
		·		Renourish	ıment at Indica	ted Year
Item				2002	2008	2014
Construction Cost				\$9,681,931	\$3,339,876	\$3,339,876
Interest During Construction				\$148,255	\$0	\$0
Total Investment Cost				\$9,830,185	\$3,339,876	\$3,339,876
Present Worth of Each Construction	n			\$9,830,185	\$2,337,890	\$1,636,507
Total Present Worth			•		\$13,804,582	,

Average Annual Cost	\$1,286,937
Interest Rate	6.125%

Estimate of Contract and Construction Costs Pompano Beach/Lauderdale-by-the-Sea and Ft. Lauderdale 100'/20' Added Shoreline Width (ft) 5/6 Year Renourishment Interval

Project Life: 50 yrs

	D. J.			T					Repou	rishment at Indica	ated Year		******			
Nourishment	Project Year	Unit Cost	Quantity	1970	1975	1980	1985	1990	1995	2000	2002	2005	2008	2010	2014	2015
Mobilization/Demobilization	0	\$1,000,000	1	\$1,000,000												
Beach Fill Beach Tilling (ac)		\$5,50 \$300	3,411,810 84,7	\$22,176,765 \$25,422												
Hard Bottom Mitigation (ac)		\$300,000	12.2	\$25,422												
1st Renourishment Mobilization/Demobilization	5	\$1,000,000	1		61 000 000											
Beach Fit!		\$5.50	935,400		\$1,000,000 \$6,080,100											
Beach Tilling (ac)		\$300	84.7	1	\$25,422											
Hard Bottom Mitigation (ac) 2nd Renourishment	10				\$0											
Mobilization/Demobilization Beach Fill		\$1,000,000 \$6.50	1 935,400			\$1,000,000										
Beach Tilling (ac)		\$300	84.7			\$6,080,100 \$25,422										
Hard Bottom Mitigation (ac) 3rd Renourishment	15					\$0										
Mobilization/Demobilization	75	\$1,000,000	1				\$1,000,000									
Beach Fill		\$6,50 \$300	935,400				\$6,080,100									
Beach Tilling (ac) Hard Bottom Mitigation (ac)		\$300	84.7	1			\$25,422 \$0									
4th Renourishment Mobilization/Demobilization	20	\$1,000,000	1	1				\$1,000,000								
Beach Fitt		\$6.50	935,400					\$6,080,100								
Beach Tilling (ac) Hard Bettern Mitigation (ac)		\$300	84.7					\$25,422 \$0								
5th Renourishment	25							40								
Mobilization/Demobilization Beach Fill		\$1,000,000 \$6.50	1 935,400						\$1,000,000							
Beach Tilling (ac)		\$300	84.7	1					\$25,422							
Hard Bottom Mitigation (ac)	30								\$0							
Mobilization/Demobilization	5.0	\$1,000,000	1							\$1,000,000						
Beach Fill Beach Tilling (ac)		\$8,50 \$300	935,400 84.7							\$7,950,900 \$25,422						
Hard Bottom Mitigation (ac)		*****	٧٦.,							\$0						
7th Renourishment Mobilization/Demobilization	35	\$1,000,000	1									\$1,000,000				
Beach Fitt		\$8.50	935,400									\$7,950,900				
Beach Tilling (ac) Hard Bottom Mitigation (ac)		\$300	84.7									\$25,422 \$0				
8th Renourishment	40											40				
Mobilization/Demobilization Beach Fill		\$1,000,000 \$8.50	1 935,400											\$1,000,000 \$7,950,900		
Beach Tilling (ac)		\$300	84.7											\$25,422		
Hard Bottom Mitigation (ac) 9th Renourishment	45													\$0		
Mobilization/Demobilization Beach Fili		\$1,000,000 \$8,50	1 935,400													\$1,000,000
Beach Tilling (ac)		\$300	84,7													\$7,950,900 \$25,422
Hard Bottom Mitigation (ac)																\$0
Addition of Ft Lauderdale	32															
Mobilization/Demobilization Beach Fill		\$1,000,000	737,000	İ							\$1,000,000 \$6,633,000					
Beach Tilling (ac)		\$300	69.0								\$20,700					
Hard Bottom Miligation (ac) 1st Renourishment of Fort Lauderdale	38	\$300,000	3.0								\$900,000					
Mobilization/Demobilization	50	\$1,000,000	1										\$1,000,000			
Beach Fill Beach Tilling (ac)		\$9.00 \$300	257,000 24,0										\$2,313,000			
Hard Bottom Mitigation (ac)		4500											\$0			
2nd Renourishment of Fort Lauderdale Mobilization/Demobilization	44	\$1,000,000	1												\$1,000,000	
Beach Fill		\$9.00	257,000												\$2,313,000	
Beach Tilling (ac) Hard Bottom Mitigation (ac)		\$300	24.0												\$7,200 \$0	
Subtotal				\$26.862.187	\$7,105,522	\$7,105,522	\$7,105,522	\$7,105,522	\$7,105,522	\$8.976.322	\$8,553,700	\$8,976,322	\$3,320,200	\$0.07c 200		£6 676 355
Contingency		15%		\$4,029,328	\$1,065,828	\$1,065,828	\$1,065,828	\$1,065,828	\$1,065,828	\$8,976,322 \$1,346,448	\$8,553,700 \$1,283,055	\$1,346,448	\$3,320,200 \$498,030	\$8,976,322 \$1,346,448	\$3,320,200 \$498,030	\$8,978,322 \$1,346,448
Subtotal Contract Cost				\$30,891,515	\$8,171,351	\$8,171,351	\$8,171,351	\$8,171,351	\$8,171,351	\$10,322,771	\$9,836,755	\$10,322,771	\$3,818,230	\$10,322,771	\$3,818,230	\$10,322,771
	Perce	ntage of Contract	Costs													
Nourishment E&D+S&A	٥	10%	1	\$3,089,152												
1st Renourishment	5				84 694 570											
E&D+S&A 2nd Renourishment	10	20%	1		\$1,634,270											
E&D+S&A		20%	1			\$1,634,270										
3rd Renourishment E&D+S&A	15	20%	1				\$1,634,270									
4th Renourishment E&D+S&A	20		1					\$1 CD 4 07C								
5th Renourishment	25	20%						\$1,634,270								
E&D+S&A 6th Renourishment	30	20%	1						\$1,634,270							
E&D+S&A		20%	1							\$2,064,554						
7th Renourishment E&D+S&A	35	20%	1									\$2,064,554				
6th Renourishment	40											42,004,034				
E&D+S&A 9th Renourishment	45	20%	1											\$2,064,554		
E&D+S&A		20%	1													2,064,554
Addition of Ft Lauderdale	32															
E&O+S&A		10%	1								\$983,676					
1st Renourishment of Fort Lauderdale E&D+S&A	38	20%	1										\$763,646			
2nd Renourishment of Fort Lauderdale	44												Ţ. 25,040		4705 515	
E&D+S&A		20%	1												\$763,646	
Total Construction Cost				\$33,980,667	\$9,805,621	\$9,805,621	\$9,805,621	\$9,805,621	\$9,805,621	\$12,387,325	\$10,820,431	\$12,387,325	\$4,581,876	\$12,387,325	\$4,561,876	\$12,387,325
							ns levent	nd Annual Co.								
						Summai	ry-Investment an	d Annual Costs		Charles C	. 13/					
item				1970	1975	1980	1985	1990	1995	ishment at Indica 2000	ted Year 2002	2005	2002	2010	2013	2015
Construction Cost				\$33,980,667	\$9,805,621	\$9,805,621	\$9,805,621	\$9,805,621	\$9,805,621	\$12,387,325	2002 \$10,820,431	\$12,387,325	2002 \$4,581,876	\$12,387,325	2013 \$4,581,876	2015 \$12,387,325
Interest During Construction				\$178,208	\$0	\$0	\$0	\$0	\$0	\$0	\$54,542	\$0	\$0	\$0	\$0	\$0
				\$34,158,874	\$9,805,621	\$9,805,621	\$9,805,621	\$9,805,621	\$9,805,621	\$12 387 325	\$10,874,972	\$12,387,325	\$4,581,876	\$12,367,325	\$4,581,676	\$12,367,325
Total Investment Cost																
Present Worth of Each Construction				\$34,158,874		\$5,411,256	\$4,019,847	\$2,986,215	\$2,218,362	\$2,081,836	\$1,622,787	\$1,546,528	\$683,718	\$1,148,866	\$355,535	\$853,455

Estimate of Contract and Construction Costs Pompano Beach/Lauderdale-by-the-Sea and Ft. Lauderdale 100' /20' Added Shoreline Width 6 Year Renourishment Interval

Project Life: 18 yrs

Item	Project Year	Unit Cost	Quantity	Renourish 2002	nment at Indica	
Nourishment	0 Tear			2002	2008	2014
	U	#4 400 000	4	04 400 000		
Mobilization/Demobilization		\$1,100,000	1	\$1,100,000		
Beach Fill- Pompano/LBTS		\$8.50	198,000	\$1,683,000		
Beach Fill- Ft. Lauderdale		\$9.00	737,000	\$6,633,000		
Beach Tilling (ac)		\$300	95.0	\$28,500		
Hard Bottom Mitigation (ac)		\$300,000	6.0	\$1,800,000		
1st Renourishment	6					
Mobilization/Demobilization		\$1,100,000	1		\$1,100,000	
Beach Fill- Pompano/LBTS		\$8.50	171,000		\$1,453,500	
Beach Fill- Ft. Lauderdale		\$9.00	257,000		\$2,313,000	
Beach Tilling (ac)		\$300	46.0		\$13,800	
Hard Bottom Mitigation (ac)		4000	0.0		\$0	
2nd Renourishment	12		0.0		ΨΟ	
Mobilization/Demobilization	12	\$1,100,000	1			\$1,100,000
Beach Fill- Pompano/LBTS		\$8.50	171,000			\$1,453,500
		* -				
Beach Fill- Ft. Lauderdale		\$9.00	257,000			\$2,313,000
Beach Tilling (ac)		\$300	46.0			\$13,800
Hard Bottom Mitigation (ac)			0.0			\$0
Subtotal				\$11,244,500	\$4,880,300	\$4,880,300
Contingency		15%		\$1,686,675	\$732,045	\$732,045
Subtotal Contract Cost		1070		\$12,931,175	\$5,612,345	\$5,612,345
				412,001,170	ψο,σ12,σ10	ψο,ο 12,ο 10
	Percer	tage of Contrac	t Costs			
Nourishment	0					
Geotechnical Investigations		\$190,000	1	\$190,000		
Secure Easements		\$250,000	1	\$250,000		
Environmental Monitoring		\$275,079	1	\$275,079		
E&D+S&A		\$1,342,000	1	\$1,342,000		
1st Renourishment	6	ψ1,012,000	•	ψ1,012,000		
Geotechnical Investigations	Ü	\$190,000	1		\$190,000	
Environmental Monitoring		\$275,079	1		\$275,079	
E&D+S&A		\$1,342,000	1			
2nd Renourishment	12	\$1,342,000	'		\$1,342,000	
	12	¢400,000	4			\$400,000
Geotechnical Investigations		\$190,000	1			\$190,000
Environmental Monitoring		\$275,079	1			\$275,079
E&D+S&A		\$1,342,000	1			\$1,342,000
Total Construction Cost				\$14,988,254	\$7,419,424	\$7,419,424
	0			01-		
	Summ	ary-Investment	and Annual	Costs		
Item				1	ment at Indica	
				2002	2008	2014
Construction Cost				\$14,988,254	\$7,419,424	\$7,419,424
Interest During Construction				\$76,503	\$0	\$0
Total Investment Cost				\$15,064,757	\$7,419,424	\$7,419,424
Present Worth of Each Construction	on			\$15,064,757	\$5,193,546	\$3,635,446
Total Present Worth					\$23,893,749	

Average Annual Cost	\$2,227,503
Interest Rate	6.125%

TABLE A-29

SUMMARY OF PROJECT COSTS

Project	Project Limits	Nourishment Interval (yrs)	Annualized Costs	Reference Table(s)
Reevaluation of Federal Project	R26 to R53	Ŋ	\$3,984,000	A-15, A-16
Implementation of the Reevaluated Federal Project	R36 to R53	10	\$967,000	A-18
Modification to the Federal Project	R53 to R74	11	\$1,574,000	A-20, A-21
Combined Reevaluation and Modification of the Federal Project	R26 to R74	5/11	\$4,146,000	A-22
Implementation of the Combined Project	R36 to R74	10	\$2,355,000	A-23, A-24
Modification to the Federal Project (NED Ft. Lauderdale Project)	R53 to R71	ဟ	\$1,287,000	A-26
Reevaluated and Modified Federal Project	R26 to R71	5/6	\$4,155,000	A-27
Implementation of the NED Combined Project	R36 to R71	ဖ	\$2,228,000	A-28

Estimate of Contract and Construction Costs Pompano Beach/Lauderdale-by-the-Sea and Ft. Lauderdale 100'/20' Added Shoreline Width (ft) 5/6 Year Renourishment Interval

Project Life: 50 yrs

ltem Nourishment				1					Renour	ishment at indica	ted Year					
	Project Year	Unit Cost	Quantity	1970	1975	1980	1985	1990	1995	2000	2002	2005	2008	2010	2014	2015
Mobilization/Demobilization	0	\$1,000,000	1	\$1,000,000												
Beach Fill		\$6.50	3,411,810	\$22,176,765												
Beach Tilling (ac) Hard Bottom Miligation (ac)		\$300 \$650,000	84.7 12.2	\$25,422 \$7,930,000												
ist Renourishment	5		,2.2	47,000,000												
Mobilization/Demobilization Beach Fill		\$1,000,000 \$6,50	1 935,400		\$1,000,000 \$6,080,100											
Beach Tilling (ac)		\$300	84.7		\$25,422											
Hard Bottom Mitigation (ac)				ļ	\$0											
2nd Renourishment Mobilization/Demobilization	10	\$1,000,000	1			\$1,000,000										
Beach Fill		\$6.50	935,400	Į.		\$6,080,100										
Beach Tilling (ac) Hard Bottom Mitigation (ac)		\$300	B4.7	l		\$25,422 \$0										
3rd Renourishment	15					40										
Mobilization/Demobilization		\$1,000,000	1	l			\$1,000,000									
Beach Fill Beach Tilling (ac)		\$6.50 \$360	935,400 84.7				\$6,080,100 \$25,422									
Hard Bottom Mitigation (ac)		4	*	l			\$0									
4th Renourishment Mobilization/Demobilization	20	\$1,000,000						\$1,000,000								
Beach Fill		\$6.50	935,400					\$6,080,100								
Beach Tilling (ac)		\$300	84.7					\$25,422								
Hard Bottom Mitigation (ac) 5th Renourishment	25							\$0								
Mobilization/Demobilization	23	\$1,000,000	1						\$1,000,000							
Beach Fill		\$6.50	935,400						\$6,080,100							
Beach Tilling (ac) Hard Bottom Mitigation (ac)		\$300	84.7						\$25,422 \$0							
th Renourishment	30															
Mobilization/Demobilization Beach Fill		\$1,000,000 \$6.50	1 935,400							\$1,000,000 \$7,950,900						
Beach Fill Beach Tilling (ac)		\$6.50 \$300	84.7							\$25,422						
Hard Bottom Mitigation (ac)										\$0						
'th Renourishment Mobilization/Demobilization	35	\$1,000,000	4									\$1,000,000				
Beach Fill		\$8.50	935,400	1								\$7,950,900				
Beach Tilling (ac)		\$300	84.7									\$25,422				
Hard Bottom Mitigation (ac) th Renourishment	40											\$0				
Mobilization/Demobilization		\$1,000,000	.1											\$1,000,000		
Beach Fill		\$8.50 \$300	935,400 84.7											\$7,950,900 \$25,422		
Beach Tilling (ac) Hard Bottom Mitigation (ac)		\$300	04.7											\$25,422 \$0		
h Renourishment	45															
Mobilization/Demobilization Beach Fill		\$1,000,000 \$8.50	1 935,400													\$1,000,000 \$7,950,900
Beach Tilling (ac)		\$300	84.7	1												\$25,422
Hard Bottom Mitigation (ac)				1												\$0
ddition of Ft Lauderdale	32			1												
Mobilization/Demobilization	J.	\$1,000,000	1								\$1,000,000					
Beach Fill		\$9.00	737,000								\$6,633,000					
Beach Tilling (ac) Hard Bottom Mitigation (ac)		\$300 \$650,000	69.0 3.0								\$20,700 \$1,950,000					
st Renourishment of Fort Lauderdale	38										,,					
Mobilization/Demobilization		\$1,000,000	1 257,000										\$1,000,000			
Beach Fiff Beach Tilling (ac)		\$9.00 \$300	257,000 24,0										\$2,313,000 \$7,200			
Hard Bottom Mitigation (ac)		-300	_4.0	l .									30			
nd Renourishment of Fort Lauderdale																
Mobilitation/Domobilizettee	44	\$1,000,000	4												\$1,000,000	
Mobilization/Demobilization Beach Fill	44	\$1,000,000 \$9.00	1 257,000												\$1,000,000 \$2,313,000	
Mobilization/Demobilization Beach Fill Beach Tilling (ac)	44	\$1,000,000 \$9.00 \$300	1 257,000 24.0												\$2,313,000 \$7,200	
Mobilization/Demobilization Beach Fill	44	\$9.00	1 257,000 24.0												\$2,313,000	
Mobilization/Demobilization Beach Fill Beach Tilling (ac)	44	\$9.00 \$300	1 257,000 24.0	\$31,132,187	\$7,105,522	\$7,105,522	\$7,105,522	\$7,105,522	\$7,105,522	\$8,976,322	\$9,603,700	\$8,976,322	\$3,320,200	\$8,978,322	\$2,313,000 \$7,200 \$0 \$3,320,200	\$8,976,322
Mobilization/Demobilization Beach Fill Beach Tilling (ac) Hard Bottom Mitigation (ac) Subtotal Contingency	44	\$9.00	1 257,000 24.0	\$4,669,828	\$1,065,828	\$1,065,828	\$1,065,828	\$1,085,828	\$1,065,828	\$1,346,448	\$1,440,555	\$1,346,448	\$498,030	\$1,346,448	\$2,313,000 \$7,200 \$0 \$3,320,200 \$498,030	\$1,346,448
Mobilization/Demobilization Beach Fill Beach Tilling (ac) Hard Bottom Milipation (ac) Subtotal	44	\$9.00 \$300	1 257,000 24.0					\$7,105,522 \$1,085,828 \$8,171,351							\$2,313,000 \$7,200 \$0 \$3,320,200	
Mobilization/Demobilization Beach Fill Beach Tilling (ac) Hard Settom Mitigation (ac) Subtotal Contingency Subtotal Contract Cost	Perc	\$9.00 \$300	24.0	\$4,669,828	\$1,065,828	\$1,065,828	\$1,065,828	\$1,085,828	\$1,065,828	\$1,346,448	\$1,440,555	\$1,346,448	\$498,030	\$1,346,448	\$2,313,000 \$7,200 \$0 \$3,320,200 \$498,030	\$1,346,448
Mobilization/Demobilization Beach Fill Beach Tilling (ac) Hard Settlom Miligation (ac) Subtotal Contingency Subtotal Contract Cost		\$9.00 \$300	24.0 Costs	\$4,669,828 \$35,802,015	\$1,065,828	\$1,065,828	\$1,065,828	\$1,085,828	\$1,065,828	\$1,346,448	\$1,440,555	\$1,346,448	\$498,030	\$1,346,448	\$2,313,000 \$7,200 \$0 \$3,320,200 \$498,030	\$1,346,448
Mobitization/Demobilization Beach Tilling (ac) Hard Steben Mitigation (ac) Subtotal ontingency Subtotal Contract Cost ourishment ESD+SSA at Renoulishment	Perc	\$9.00 \$300 15% centage of Contract	24.0	\$4,669,828	\$1,065,828 \$8,171,351	\$1,065,828	\$1,065,828	\$1,085,828	\$1,065,828	\$1,346,448	\$1,440,555	\$1,346,448	\$498,030	\$1,346,448	\$2,313,000 \$7,200 \$0 \$3,320,200 \$498,030	\$1,346,448
Mobilization/Demobilization Beach Tilling (ac) Hard Bottom Mitigation (ac) Subtotal onlingency Subtotal Contract Cost ourishment E&D+S&A at Renoulishment E&D+S&A	Perc 0 S	\$9.00 \$300	24.0 Costs	\$4,669,828 \$35,802,015	\$1,065,828	\$1,065,828	\$1,065,828	\$1,085,828	\$1,065,828	\$1,346,448	\$1,440,555	\$1,346,448	\$498,030	\$1,346,448	\$2,313,000 \$7,200 \$0 \$3,320,200 \$498,030	\$1,346,448
Mobilization/Demobilization Beach Tilling (ac) Hard Stebern Mitigation (ac) Subtotal Subtotal Subtotal Contingency Subtotal Contract Cost Iourishment EAD+SAA st Renoutishment EAD+SAA	Perc	\$9.00 \$300 15% centage of Contract 10% 20%	24.0 Costs 1	\$4,669,828 \$35,802,015	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828	\$1,085,828	\$1,065,828	\$1,346,448	\$1,440,555	\$1,346,448	\$498,030	\$1,346,448	\$2,313,000 \$7,200 \$0 \$3,320,200 \$498,030	\$1,346,448
Mobitization/Demobilization Beach Tilling (ac) Hard Bottom Mitigation (ac) Subtotal antingency Subtotal Contract Cost ourishment ESD-SSA tenoutishment ESD-SSA de Renoutishment ESD-SSA de Renoutishment ESD-SSA de Renoutishment	Perc 0 S	\$5.00 \$300 15% centage of Contract 10% 20%	24.0 Costs 1 1 1	\$4,669,828 \$35,802,015	\$1,065,828 \$8,171,351	\$1,065,828	\$1,065,828 \$8,171,351	\$1,085,828	\$1,065,828	\$1,346,448	\$1,440,555	\$1,346,448	\$498,030	\$1,346,448	\$2,313,000 \$7,200 \$0 \$3,320,200 \$498,030	\$1,346,448
Mobibization/Demobibization Beach Tilling (ac) Hard Settom Mitigation (ac) Subtotal Sontingery Subtotal Contract Cost tourishment EAD+SAA at Renoudshment EAD+SAA rd Renoudshment EAD+SAA rd Renoudshment EAD+SAA	Perc 0 5 10	\$9.00 \$300 15% centage of Contract 10% 20%	24.0 Costs 1	\$4,669,828 \$35,802,015	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828	\$1,085,828	\$1,065,828	\$1,346,448	\$1,440,555	\$1,346,448	\$498,030	\$1,346,448	\$2,313,000 \$7,200 \$0 \$3,320,200 \$498,030	\$1,346,448
Mobitization/Demobilization Beach Tilling (ac) Hard Settom Mitigation (ac) Hard Settom Mitigation (ac) Subtotal onlingency Subtotal Contract Cost ourishment EAD+SAA st Renoudshment EAD+SAA rd Renoudshment EAD+SAA	Perc 0 5	\$9.00 \$300 15% centage of Contract 10% 20% 20%	24.0 Costs 1 1 1	\$4,669,828 \$35,802,015	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828	\$1,346,448	\$1,440,555	\$1,346,448	\$498,030	\$1,346,448	\$2,313,000 \$7,200 \$0 \$3,320,200 \$498,030	\$1,346,448
Mobilization/Demobilization Beach Tilling (ac) Hard Bottom Mitigation (ac) Subtotal ontingency Subtotal Contract Cost ourishment EAD-SAA Is Remoulshment EAD-SAA Id Remoulshment EAD-SAA Id Remoulshment EAD-SAA Id Remoulshment EAD-SAA Id Remoulshment EAD-SAA Id Remoulshment EAD-SAA Id Remoulshment EAD-SAA Id Remoulshment EAD-SAA In Remoulshment EAD-SAA In Remoulshment	Perc 0 5 10	\$9.00 \$300 15% centage of Contract 10% 20% 20% 20%	24.0 Costs 1 1 1 1 1	\$4,669,828 \$35,802,015	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,085,828	\$1,085,828 \$8,171,3\$1	\$1,346,448	\$1,440,555	\$1,346,448	\$498,030	\$1,346,448	\$2,313,000 \$7,200 \$0 \$3,320,200 \$498,030	\$1,346,448
Mobilization/Demobilization Beach Tilling (ac) Beach Tilling (ac) Hard Sottom Mitigation (ac) Subtotal Continuency Subtotal Contract Cost Continuency Subtotal Contract Cost Continuency Subtotal Contract Cost Continuency Subtotal Contract Cost Contract Cost	Perc 0 5 10 15 20 25	\$9.00 \$300 15% centage of Contract 10% 20% 20%	24.0 Costs 1 1 1	\$4,669,828 \$35,802,015	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828	\$1,346,448	\$1,440,555	\$1,346,448	\$498,030	\$1,346,448	\$2,313,000 \$7,200 \$0 \$3,320,200 \$498,030	\$1,346,448
Mobitization/Demobilization Beach Tilling (ac) Hard Sottom Mitigation (ac) Subtotal ontingency Subtotal Contract Cost ourishment E&D+S&A at Renourishment E&D+S&A de Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A	Perc 0 5 10 15 20	\$9.00 \$300 15% 	24.0 Costs 1 1 1 1 1	\$4,669,828 \$35,802,015	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,085,828 \$8,171,3\$1	\$1,346,448 \$10,322,771	\$1,440,555	\$1,346,448	\$498,030	\$1,346,448	\$2,313,000 \$7,200 \$0 \$3,320,200 \$498,030	\$1,346,448
Mobitization/Demobilization Beach Tilling (ac) Hard Sottom Mitigation (ac) Subtotal Subtotal Subtotal Subtotal Contract Cost ourishment EAD+SA at Renoutishment EAD+SA dt Renoutishment EAD+SA ht Renoutishment EAD+SA ht Renoutishment EAD+SA ht Renoutishment EAD+SA ht Renoutishment EAD+SA ht Renoutishment EAD+SA ht Renoutishment EAD+SA ht Renoutishment EAD+SA ht Renoutishment	Perc 0 5 10 15 20 25	\$5.00 \$300 15% centage of Contract 10% 20% 20% 20% 20% 20%	24.0 Costs 1 1 1 1 1 1	\$4,669,828 \$35,802,015	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,085,828 \$8,171,3\$1	\$1,346,448	\$1,440,555	\$1,346,448 \$10,322,771	\$498,030	\$1,346,448	\$2,313,000 \$7,200 \$0 \$3,320,200 \$498,030	\$1,346,448
Mobitization/Demobilization Beach Täfing (ac) Hard Steben Mitigation (ac) Subtotal S	Perc 0 5 10 15 20 25 30	\$9.00 \$300 15% 	24.0 Costs 1 1 1 1 1	\$4,669,828 \$35,802,015	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,085,828 \$8,171,3\$1	\$1,346,448 \$10,322,771	\$1,440,555	\$1,346,448	\$498,030	\$1,346,448	\$2,313,000 \$7,200 \$0 \$3,320,200 \$498,030	\$1,346,448
Mobilization/Demobilization Beach Tilling (ac) Hard Stetem Mitigation (ac) Subtotal Subtotal Soutional Contract Cost Soutional Contract Cost Soutional Contract Cost Soutional Contract Cost Soutional Contract Cost Soutional Contract Cost Soutional Contract Cost Soutional Contract Cost Soutional Contract Cost Soutional Contract Cost Soutional Contract Cost Soutional	0 Perc 5 10 15 20 25 30	\$5.00 \$300 15% 	24.0 Costs 1 1 1 1 1 1	\$4,669,828 \$35,802,015	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,085,828 \$8,171,3\$1	\$1,346,448 \$10,322,771	\$1,440,555	\$1,346,448 \$10,322,771	\$498,030	\$1,346,448 \$10,322,771	\$2,313,000 \$7,200 \$0 \$3,320,200 \$498,030	\$1,346,448
Mobilization/Demobilization Beach Tilling (sc) Hard Settom Mitigation (ac) Subtotal	Perc 0 5 10 15 20 25 30	\$5.00 \$300 15% 	24.0 Costs 1 1 1 1 1 1 1 1 1 1 1 1 1	\$4,669,828 \$35,802,015	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,085,828 \$8,171,3\$1	\$1,346,448 \$10,322,771	\$1,440,555	\$1,346,448 \$10,322,771	\$498,030	\$1,346,448	\$2,313,000 \$7,200 \$0 \$3,320,200 \$498,030	\$1,346,448 \$10,322,771
Mobitization/Demobilization Beach Tilling (ac) Hard Steben Mitigation (ac) Subtotal	Perc 0 5 10 15 20 25 30 35 40	\$5.00 \$300 15% 	24.0 Costs 1 1 1 1 1 1 1	\$4,669,828 \$35,802,015	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,085,828 \$8,171,3\$1	\$1,346,448 \$10,322,771	\$1,440,555	\$1,346,448 \$10,322,771	\$498,030	\$1,346,448 \$10,322,771	\$2,313,000 \$7,200 \$0 \$3,320,200 \$498,030	\$1,346,448
Mobilization/Demobilization Beach Tilling (se) Hard Settom Mitigation (ac) Subtotal Subtotal Sontingency Subtotal Contract Cost Iourishment EAD+SAA It Renourishment EAD+SAA Id Renourishment EAD+SAA In Renourishment	Perc 0 5 10 15 20 25 30 35 40	\$5.00 \$300 15% centage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20%	24.0 Costs 1 1 1 1 1 1 1 1 1 1 1 1 1	\$4,669,828 \$35,802,015	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,085,828 \$8,171,3\$1	\$1,346,448 \$10,322,771	\$1,440,555 \$11,044,255	\$1,346,448 \$10,322,771	\$498,030	\$1,346,448 \$10,322,771	\$2,313,000 \$7,200 \$0 \$3,320,200 \$498,030	\$1,346,448 \$10,322,771
Mobibization/Demobibization Beach Täling (ac) Hard Sottom Mitigation (ac) Subtotal Sontingency Subtotal S	Perc 0 5 10 15 20 25 30 35 40 45	\$5.00 \$300 15% 	24.0 Costs 1 1 1 1 1 1 1 1 1 1 1 1 1	\$4,669,828 \$35,802,015	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,085,828 \$8,171,3\$1	\$1,346,448 \$10,322,771	\$1,440,555	\$1,346,448 \$10,322,771	\$498,030	\$1,346,448 \$10,322,771	\$2,313,000 \$7,200 \$0 \$3,320,200 \$498,030	\$1,346,448 \$10,322,771
Mobitization/Demobilization Beach Tilling (ac) Hard Settom Mitigation (ac) Subtotal	Perc 0 5 10 15 20 25 30 35 40 45	\$5.00 \$300 15% centage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20%	24.0 Costs 1 1 1 1 1 1 1 1 1 1 1 1 1	\$4,669,828 \$35,802,015	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,085,828 \$8,171,3\$1	\$1,346,448 \$10,322,771	\$1,440,555 \$11,044,255	\$1,346,448 \$10,322,771	\$498,030	\$1,346,448 \$10,322,771	\$2,313,000 \$7,200 \$0 \$3,320,200 \$498,030	\$1,346,448 \$10,322,771
Mobilization Demobilization Beach Filling (ac) Hard Sottom Mitigation (ac) Subtotal Solitorian Contract Cost ourishment EAD+SA st Renourishment EAD+SA de Renourishment EAD+SA h Renourishment	Perc 0 5 10 15 20 25 30 35 40 45	\$5.00 \$300 15% centage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	24.0 Costs 1 1 1 1 1 1 1 1 1	\$4,669,828 \$35,802,015	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,085,828 \$8,171,3\$1	\$1,346,448 \$10,322,771	\$1,440,555 \$11,044,255	\$1,346,448 \$10,322,771	\$498,030 \$3,818,230	\$1,346,448 \$10,322,771	\$2,313,000 \$7,200 \$0 \$3,320,200 \$499,030 \$3,619,230	\$1,346,448 \$10,322,771
Mobilization/Demokibization Beach Filling (ac) Hard Settom Mitigation (ac) Subtotal Indingency Indingency Ind	Perc 0 5 10 15 20 25 30 35 40 45	\$5.00 \$300 15% centage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20%	24.0 Costs 1 1 1 1 1 1 1 1 1 1 1 1 1	\$4,669,828 \$35,802,015	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,085,828 \$8,171,3\$1	\$1,346,448 \$10,322,771	\$1,440,555 \$11,044,255	\$1,346,448 \$10,322,771	\$498,030 \$3,818,230	\$1,346,448 \$10,322,771	\$2,313,000 \$7,200 \$0 \$3,320,200 \$498,030	\$1,346,448 \$10,322,771
Mobilization/Demobilization Beach Filing (ac) Beach Filing (ac) Hard Settom Mitigation (ac) Subtotal S	Perc 0 5 10 15 20 25 30 35 40 45	\$5.00 \$300 15% centage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	24.0 Costs 1 1 1 1 1 1 1 1 1	\$4,699.628 \$35,602,015	\$1,055,528 \$8,171,351 \$1,634,270	\$1,085,028 \$8,171,381 \$1,634,270	\$1,085,628 \$8,171,351	\$1,085,628 \$8,171,351	\$1,085,828 \$8,171,351 \$1,634,270	\$1,346,448 \$10,322,771 \$2,064,554	31,440,555 \$11,044,255	\$1,346,448 \$10,322,771 \$2,064,554	\$498,030 \$3,818,230 \$3,818,230	\$1,346,448 \$10,322,771	\$2,313,000 \$7,200 \$3,202,000 \$499,030 \$3,818,230	\$1,346,448 \$10,322,771
Mobilization/Demobilization Beach Filing (ac) Hard Sottom Mitigation (ac) Subtotal S	Perc 0 5 10 15 20 25 30 35 40 45	\$5.00 \$300 15% centage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	24.0 Costs 1 1 1 1 1 1 1 1 1	\$4,669,828 \$35,802,015	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,085,828 \$8,171,3\$1	\$1,346,448 \$10,322,771	31,440,555 \$11,044,255	\$1,346,448 \$10,322,771 \$2,064,554	\$498,030 \$3,818,230	\$1,346,448 \$10,322,771	\$2,313,000 \$7,200 \$0 \$3,320,200 \$499,030 \$3,619,230	\$1,346,448 \$10,322,771
Mobitization Demobilization Beach Filling (ac) Hard Sottom Mitigation (ac) Subtotal Subtotal Subtotal Contract Cost ourishment E&D+S&A st Renourishment E&D+S&A de Renourishment E&D+S&A h Renourishment EBD+S&A h Renourishme	Perc 0 5 10 15 20 25 30 35 40 45	\$5.00 \$300 15% centage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	24.0 Costs 1 1 1 1 1 1 1 1 1	\$4,699.628 \$35,602,015	\$1,055,528 \$8,171,351 \$1,634,270	\$1,085,828 \$6,171,351 \$1,634,270 \$9,805,621	\$1,085,828 \$8,171,391 \$1,634,270 \$9,805,621	\$1,085,628 \$8,171,351 \$1,534,270 \$1,534,270	\$1,085,828 \$8,171,351 \$1,634,270	\$1,346,448 \$10,322,771 \$2,064,554	31,440,555 \$11,044,255	\$1,346,448 \$10,322,771 \$2,064,554	\$498,030 \$3,818,230 \$3,818,230	\$1,346,448 \$10,322,771	\$2,313,000 \$7,200 \$3,202,000 \$499,030 \$3,818,230	\$1,346,448 \$10,322,771
Mobilization/Demobilization Beach Filing (ac) Hard Settem Mitigation (ac) Subtotal S	Perc 0 5 10 15 20 25 30 35 40 45	\$5.00 \$300 15% centage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	24.0 Costs 1 1 1 1 1 1 1 1 1	\$4,699.628 \$35,602,015	\$1,055,528 \$8,171,351 \$1,634,270	\$1,085,828 \$6,171,351 \$1,634,270 \$9,805,621	\$1,085,628 \$8,171,351	\$1,085,628 \$8,171,351 \$1,534,270 \$1,534,270	\$1,085,828 \$6,171,351 \$1,634,270 \$1,634,270	\$1,346,448 \$10,322,771 \$2,064,554 \$12,367,325	\$1,440,555 \$11,044,255 \$11,044,255	\$1,346,448 \$10,322,771 \$2,064,554	\$498,030 \$3,818,230 \$3,818,230	\$1,346,448 \$10,322,771	\$2,313,000 \$7,200 \$3,202,000 \$499,030 \$3,818,230	\$1,346,448 \$10,322,77°
Mobitization Demobilization Beach Filling (ac) Hard Sottom Mitigation (ac) Subtotal Subtotal Subtotal Contract Cost ourishment E&D+S&A st Renourishment E&D+S&A de Renourishment E&D+S&A h Renourishment EBD+S&A h Renourishme	Perc 0 5 10 15 20 25 30 35 40 45	\$5.00 \$300 15% centage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	24.0 Costs 1 1 1 1 1 1 1 1 1	\$4,699.028 \$35,602,015 \$3,590,202	\$1,085,528 \$8,171,351 \$1,634,270 39,805,821	\$1,085,028 \$6,171,351 \$1,634,270 \$9,605,621 Stammal	\$1,085,828 \$8,171,351 \$1,634,270 \$9,605,821 y-investment an	\$1,085,628 \$8,171,351 \$1,534,270 \$9,605,621	\$1,085,828 \$8,171,331 \$1,634,270 \$9,805,621	\$1,346,448 \$10,322,771 \$2,064,554 \$12,367,325	31,440,555 \$11,044,255 \$11,044,255	\$1,346,448 \$10,322,771 \$2,064,554 \$12,397,325	\$498,030 \$3,818,230 \$765,646 \$4,561,676	\$1,346,448 \$10,322,771 \$2,084,554	\$2,313,000 \$7,200 \$3,320,200 \$499,033 \$3,419,230 \$763,648 \$4,591,876	\$1,346,448 \$10,322,771 2,064,554 \$12,367,325
Mobilization/Demobilization Beach Filling (ac) Hard Sottom Mitigation (ac) Subtotal Solitorian Contract Cost ourishment EAD+SAA st Renourishment EAD+SAA de Renourishment EAD+SAA h Renourishment EAD+SAA Total Construction EAD+SAA I Renourishment EAD+SAA H Renourishment EAD+SAA H Renourishment EAD+SAA H Renourishment EAD+SAA H Renourishment EAD+SAA H Renourishment EAD+SAA H Renourishment EAD+SAA H Renourishment EAD+SAA H Renourishment EAD+SAA H Renourishment EAD+SAA H Renourishment H Renourishment H Renourishment EAD+SAA H Renourishment EAD+SAA H Renourishment H Renour	Perc 0 5 10 15 20 25 30 35 40 45	\$5.00 \$300 15% centage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	24.0 Costs 1 1 1 1 1 1 1 1 1	\$4,699.028 \$35,502.015 \$3,590,202 \$3,590,202	\$1,655,528 \$8,171,351 \$1,634,270 \$9,805,821	\$1,085,028 \$8,171,391 \$1,634,270 \$9,605,621 Summu	\$1,085,828 \$8,171,351 \$1,634,270 \$9,805,821 y-investment an	\$1,085,628 \$8,171,351 \$1,834,270 \$9,805,621 d Angual Costs	\$1,085,828 \$8,171,351 \$1,634,270 \$1,634,270 \$8,605,821 Renour	\$1,346,448 \$10,322,771 \$2,064,554 \$12,367,325	31,440,555 \$11,044,255 \$11,044,255	\$1,346,448 \$10,322,771 \$2,064,554 \$12,397,325	\$498,030 \$3,818,230 \$763,848 \$4,581,876	\$1,346,448 \$10,322,771 \$2,084,554 \$12,367,325	\$2,313,000 \$7,200 \$3,202,200 \$499,030 \$3,818,230 \$3,818,230	\$1,346,448 \$10,322,771 2,064,554 \$12,367,325
Mobitization/Demobilization Beach Filling (ac) Beach Filling (ac) Hard Settom Mitigation (ac) Subtotal Subtotal Ontingency Subtotal Contract Cost ourishment SEAP-SSA IR Renoutshment EAD-SSA Renoutshment Renoutshment EAD-SSA Renoutshment EAD-SSA Renoutshment Reno	Perc 0 5 10 15 20 25 30 35 40 45	\$5.00 \$300 15% centage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	24.0 Costs 1 1 1 1 1 1 1 1 1	\$4,699.628 \$35,602,015	\$1,085,528 \$8,171,351 \$1,634,270 39,805,821	\$1,085,028 \$6,171,351 \$1,634,270 \$9,605,621 Stammal	\$1,085,828 \$8,171,351 \$1,634,270 \$9,605,821 y-investment an	\$1,085,628 \$8,171,351 \$1,534,270 \$9,605,621	\$1,085,828 \$8,171,331 \$1,634,270 \$9,805,621	\$1,346,448 \$10,322,771 \$2,064,554 \$12,367,325	\$1,440,555 \$11,044,255 \$11,044,255	\$1,346,448 \$10,322,771 \$2,064,554	\$498,030 \$3,818,230 \$765,646 \$4,561,676	\$1,346,448 \$10,322,771 \$2,084,554	\$2,313,000 \$7,200 \$3,320,200 \$499,033 \$3,419,230 \$763,648 \$4,591,876	\$1,346,448 \$10,322,771 2,064,554 \$12,367,325
Mobilization/Demobilization Beach Filling (ac) Beach Filling (ac) Hard Settom Mitigation (ac) Subtotal Subtotal Ontingency Subtotal Contract Cost ourishment EAD-S&A It Renoutshment It Lauderdale EAD-S&A It Renoutshment	Perc 0 5 10 15 20 25 30 35 40 45	\$5.00 \$300 15% centage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	24.0 Costs 1 1 1 1 1 1 1 1 1	\$4,699.028 \$35,602.015 \$3,590,202 \$3,590,202 \$3,590,202	\$1,085,528 \$8,171,351 \$1,634,270 \$1,634,270 \$9,805,621	\$1,085,028 \$8,171,351 \$1,634,270 \$1,634,270 \$9,805,621 \$9,805,621	\$1,085,828 \$8,171,351 \$1,634,270 \$1,634,270 \$9,805,821 \$9,805,621 \$9,805,621	\$1,695,628 \$8,171,351 \$1,694,270 \$9,605,621 d Annual Costs 1990 \$9,605,621 \$9,805,621	\$1,095,928 \$8,171,331 \$1,634,270 \$1,634,270 \$9,605,921 \$9,605,921 \$9,605,921	\$1,346,448 \$10,322,771 \$2,064,554 \$2,064,554 \$12,367,325 \$00 \$12,367,325 \$0	31,440,555 \$11,044,255 \$11,044,255 \$11,104,426 \$12,148,681 \$12,148,681 \$12,148,681 \$12,148,681	\$1,346,448 \$10,322,771 \$2,064,554 \$12,367,325 \$12,367,325 \$0	\$498,030 \$3,818,230 \$763,848 \$4,581,876 \$4,581,876 \$4,581,876 \$0	\$1,346,448 \$10,322,771 \$2,084,554 \$12,397,325 \$0 \$12,397,325	\$2,313,000 \$7,200 \$0 \$3,320,200 \$3,320,200 \$3,320,200 \$3,320,200 \$3,320,200 \$3,320,200 \$3,320,200 \$3,419,230 \$3,419,230 \$4,581,876 \$4,581,876 \$5	\$1,346,446 \$10,322,771 2,064,554 \$12,367,325 \$12,367,325
Mobilization/Demobilization Beach Filling (ac) Hard Settom Mitigation (ac) Subtotal	Perc 0 5 10 15 20 25 30 35 40 45	\$5.00 \$300 15% centage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	24.0 Costs 1 1 1 1 1 1 1 1 1	\$4,699.628 \$35,602,015 \$3,590,202 \$3,590,202 \$39,392,217	\$1,655,528 \$8,171,351 \$1,634,270 \$1,634,270 \$9,805,821 \$9,805,821 \$9,805,821 \$9,805,821	\$1,055,628 \$8,171,351 \$1,634,270 \$1,634,270 \$9,605,621 \$4,634,270 \$9,605,621 \$9,605,621 \$9,605,621	\$1,085,828 \$8,171,391 \$1,634,270 \$9,605,821 \$9,805,621 \$9,805,621 \$9,805,621	\$1,085,628 \$8,171,351 \$1,834,270 \$9,805,621 d Annual Costs 1990 \$9,805,621 \$5,000 \$9,805,621	\$1,085,828 \$6,171,351 \$1,634,270 \$1,634,270 \$9,605,621 \$9,605,621 \$9,605,621	\$1,346,448 \$10,322,771 \$2,064,554 \$2,064,554 \$12,387,325 \$37,325 \$12,387,325 \$12,387,325	\$1,440,555 \$11,044,255 \$11,044,255 \$12,148,881 \$12,148,881 \$12,148,881 \$12,148,881 \$12,207,447	\$1,346,448 \$10,322,771 \$2,064,554 \$2,064,554 \$2,064,554 \$12,367,325 \$0 \$12,367,325	\$498,030 \$3,818,230 \$763,848 \$4,581,876 \$4,581,876 \$4,581,876 \$4,581,876	\$1,346,448 \$10,322,771 \$2,084,554 \$12,387,325 \$12,387,325 \$0 \$12,387,325	\$2,313,000 \$7,200 \$3,320,200 \$499,030 \$3,616,230 \$3,616,230 \$4,591,676 \$4,591,676 \$4,591,676	\$1,346,448 \$10,322,771 2,064,554 2,064,554 \$12,367,325 \$12,367,325 \$12,367,325
Mobilization/Demobilization Beach Fill Bench Tilling (ac) Hard Sottom Mitigation (ac) Subtotal Subtotal Subtotal Subtotal Contract Cost ourishment EAD-S&A It Renoutshment EAD-S&A It Renoutshment EAD-S&A A Renoutshment EAD-S&A A Renoutshment EAD-S&A A Renoutshment EAD-S&A A Renoutshment EAD-S&A A Renoutshment EAD-S&A A Renoutshment EAD-S&A A Renoutshment EAD-S&A A Renoutshment EAD-S&A A Renoutshment EAD-S&A A Renoutshment EAD-S&A A Renoutshment EAD-S&A A Renoutshment EAD-S&A A Renoutshment EAD-S&A A Renoutshment EAD-S&A A Renoutshment EAD-S&A Total Construction It caused a Renoutshment EAD-S&A Total Construction Cost	Perc 0 5 10 15 20 25 30 35 40 45	\$5.00 \$300 15% centage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	24.0 Costs 1 1 1 1 1 1 1 1 1	\$4,699.028 \$35,602.015 \$3,590,202 \$3,590,202 \$3,590,202	\$1,085,528 \$8,171,351 \$1,634,270 \$1,634,270 \$9,805,621	\$1,085,028 \$8,171,351 \$1,634,270 \$1,634,270 \$9,805,621 \$9,805,621	\$1,085,828 \$8,171,351 \$1,634,270 \$1,634,270 \$9,805,821 \$9,805,621 \$9,805,621	\$1,695,628 \$8,171,351 \$1,694,270 \$9,605,621 d Annual Costs 1990 \$9,605,621 \$9,805,621	\$1,095,928 \$8,171,331 \$1,634,270 \$1,634,270 \$9,605,921 \$9,605,921 \$9,605,921	\$1,346,448 \$10,322,771 \$2,064,554 \$2,064,554 \$12,367,325 \$00 \$12,367,325 \$0	31,440,555 \$11,044,255 \$11,044,255 \$11,104,426 \$12,148,681 \$12,148,681 \$12,148,681 \$12,148,681	\$1,346,448 \$10,322,771 \$2,064,554 \$12,367,325 \$12,367,325 \$0	\$498,030 \$3,818,230 \$763,848 \$4,581,876 \$4,581,876 \$4,581,876 \$0	\$1,346,448 \$10,322,771 \$2,084,554 \$12,397,325 \$0 \$12,397,325	\$2,313,000 \$7,200 \$0 \$3,320,200 \$3,320,200 \$3,320,200 \$3,320,200 \$3,320,200 \$3,320,200 \$3,320,200 \$3,419,230 \$3,419,230 \$4,581,876 \$4,581,876 \$5	\$1,346,448 \$10,322,771 2,064,554 \$12,367,325 \$12,367,325

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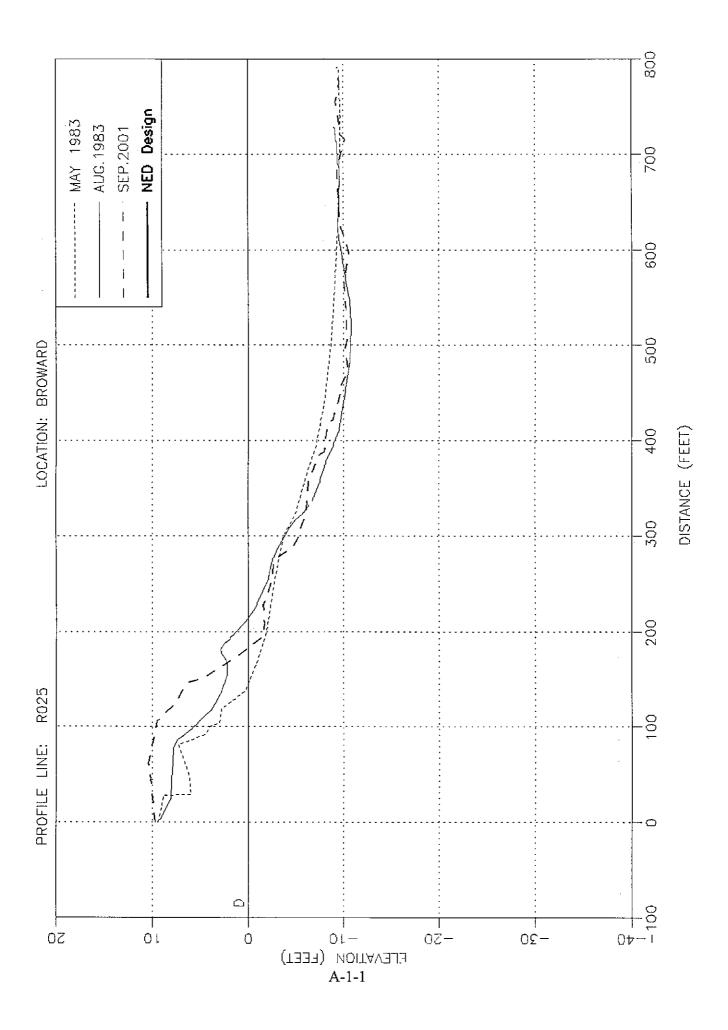
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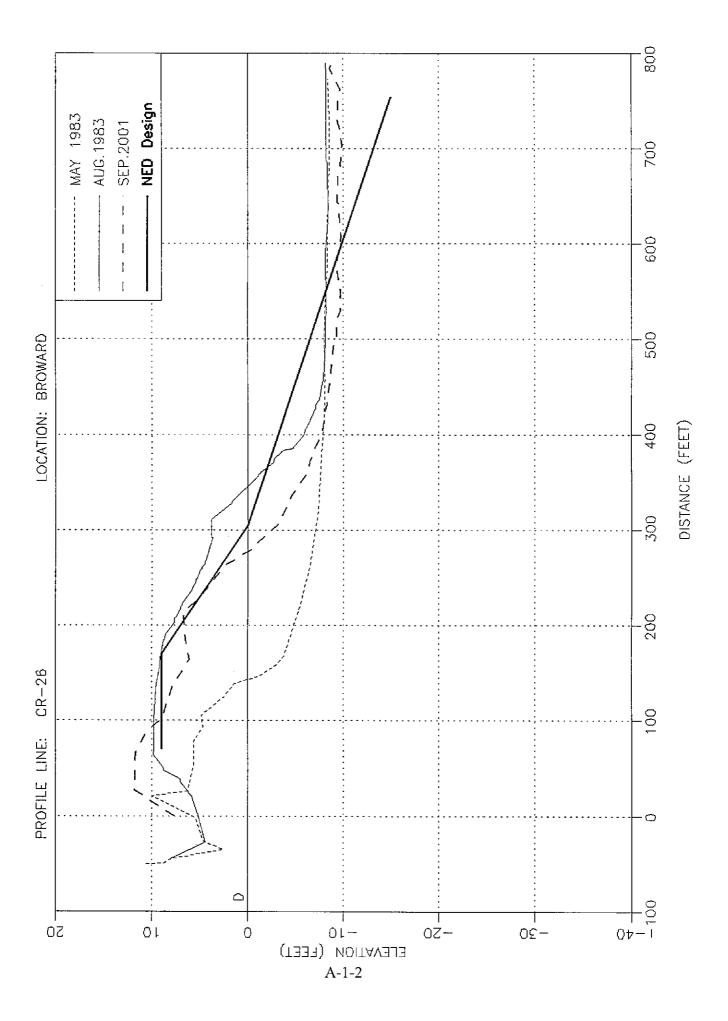
SUB-APPENDIX A-1

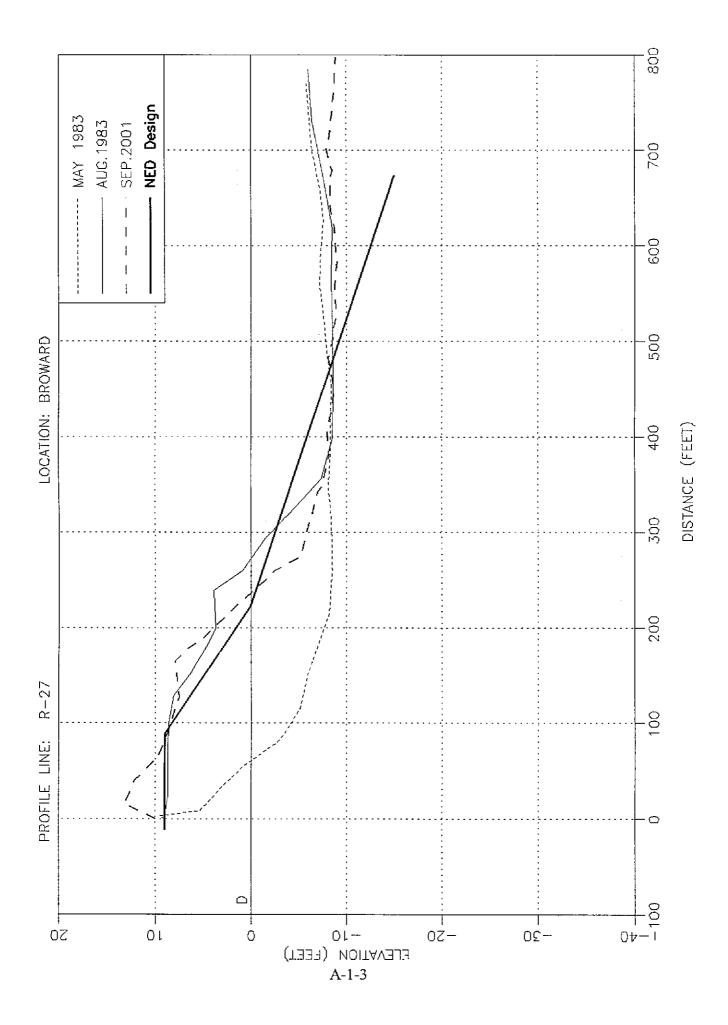
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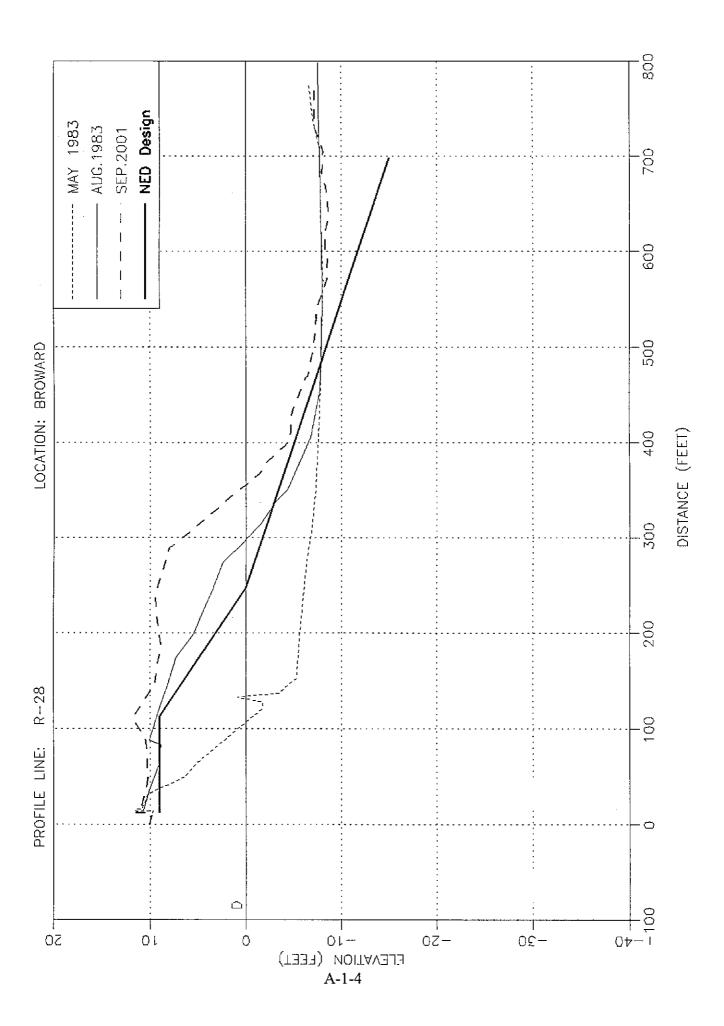
POMPANO BEACH/LAUDERDALE-BY-THE-SEA

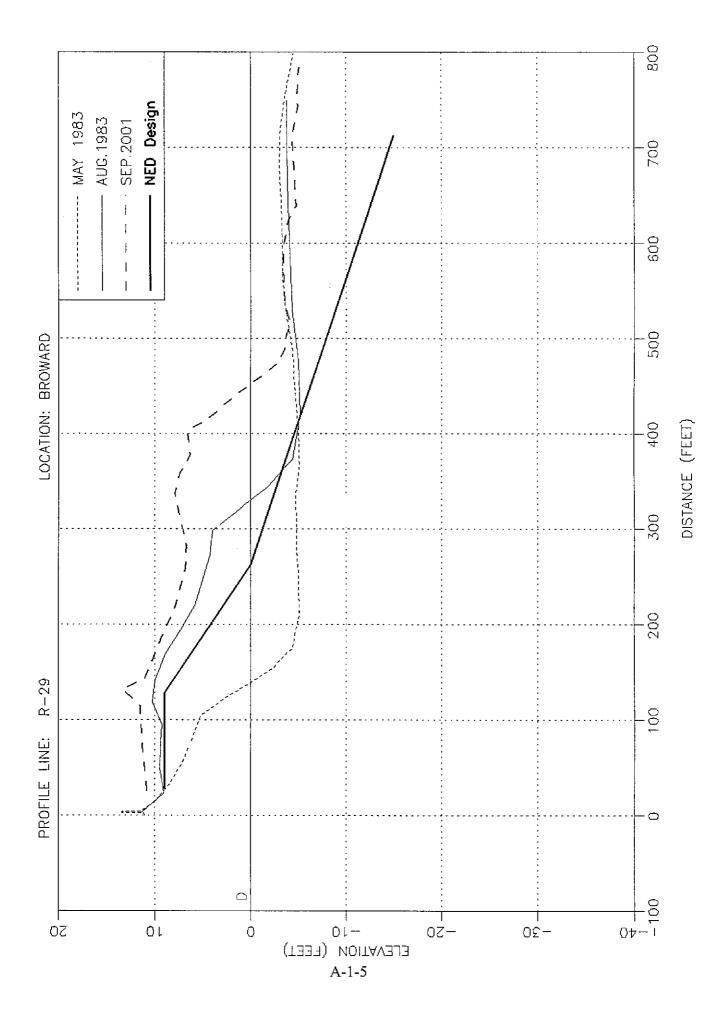
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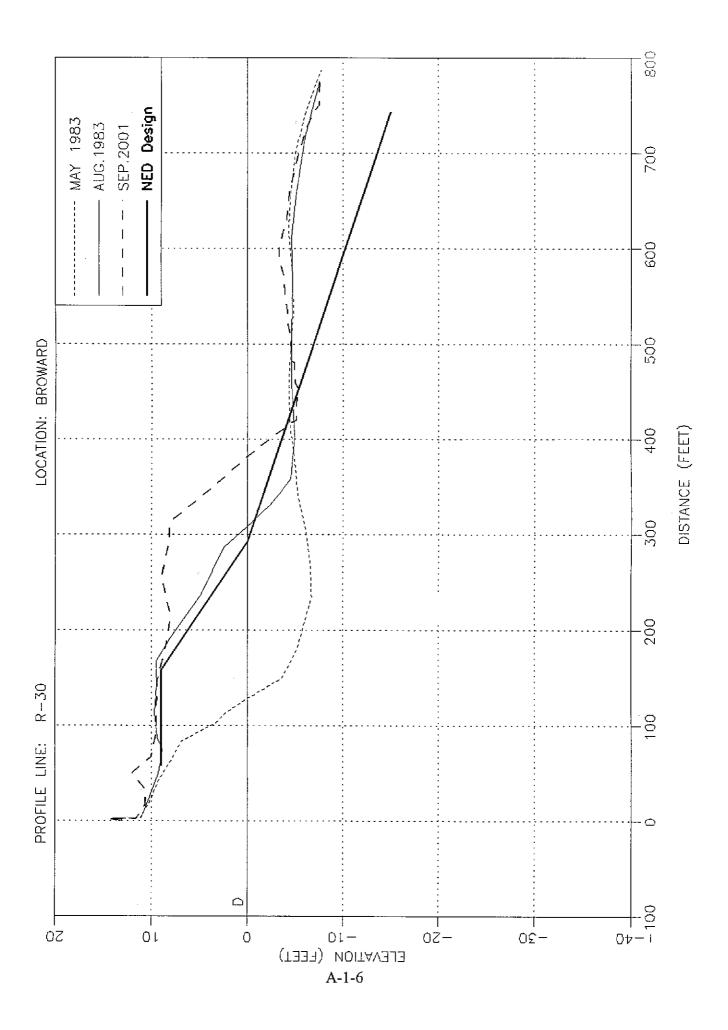


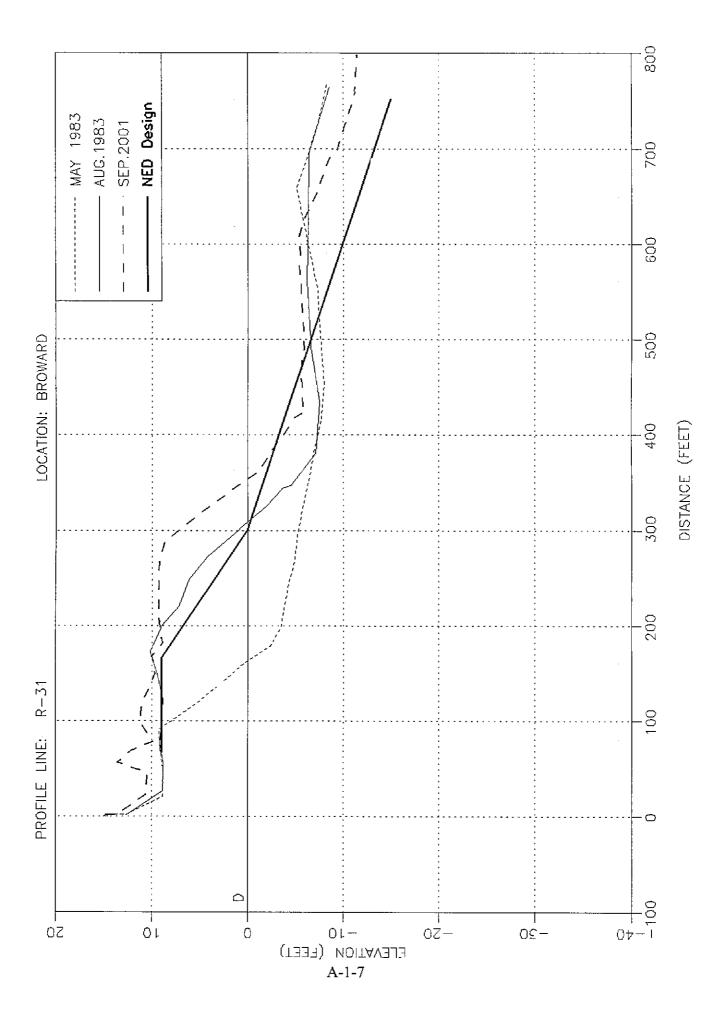


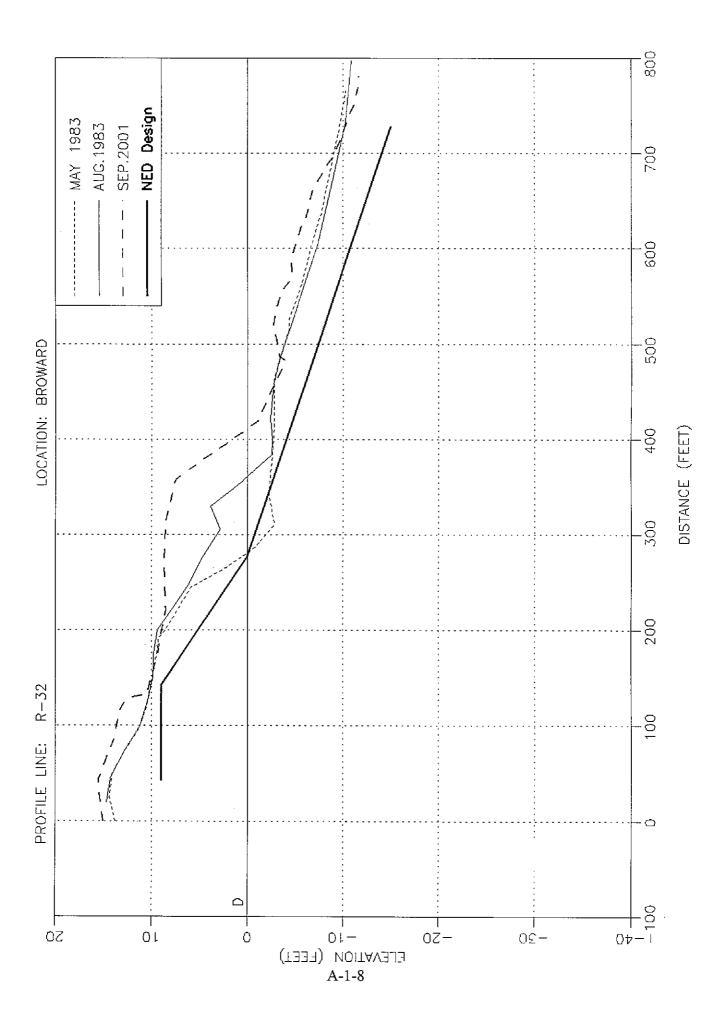


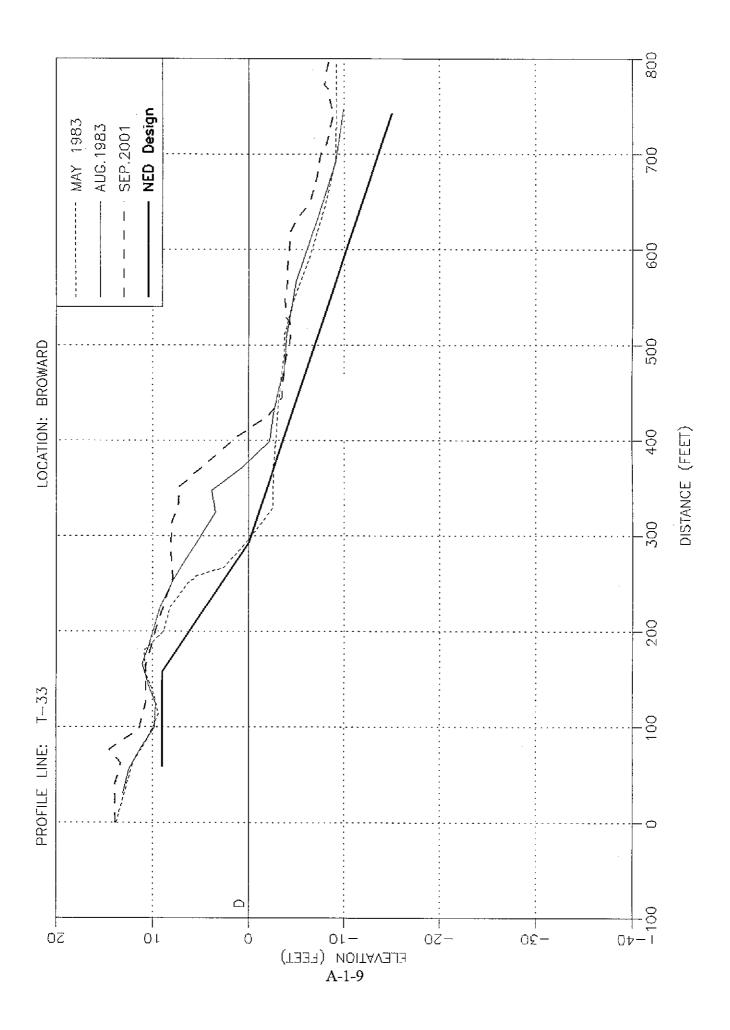


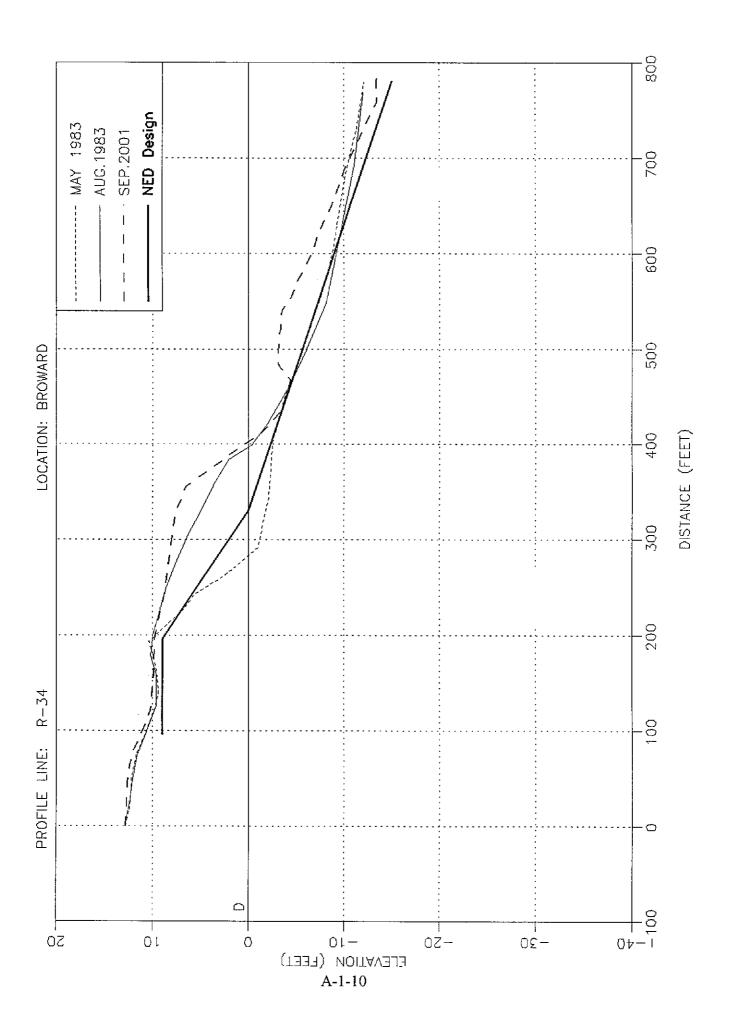


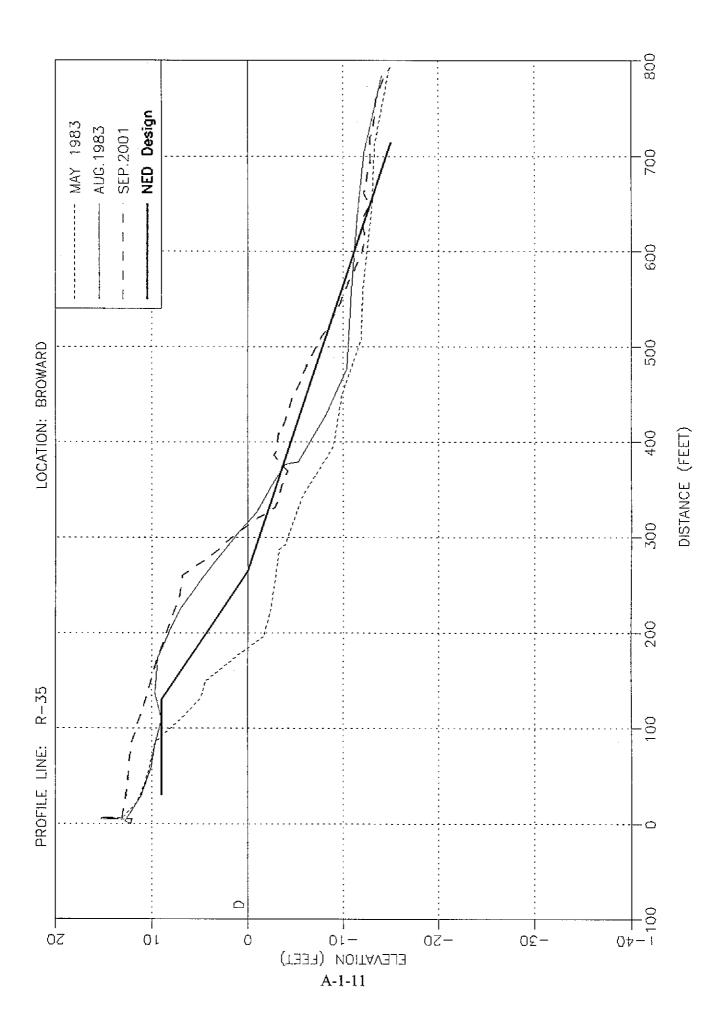


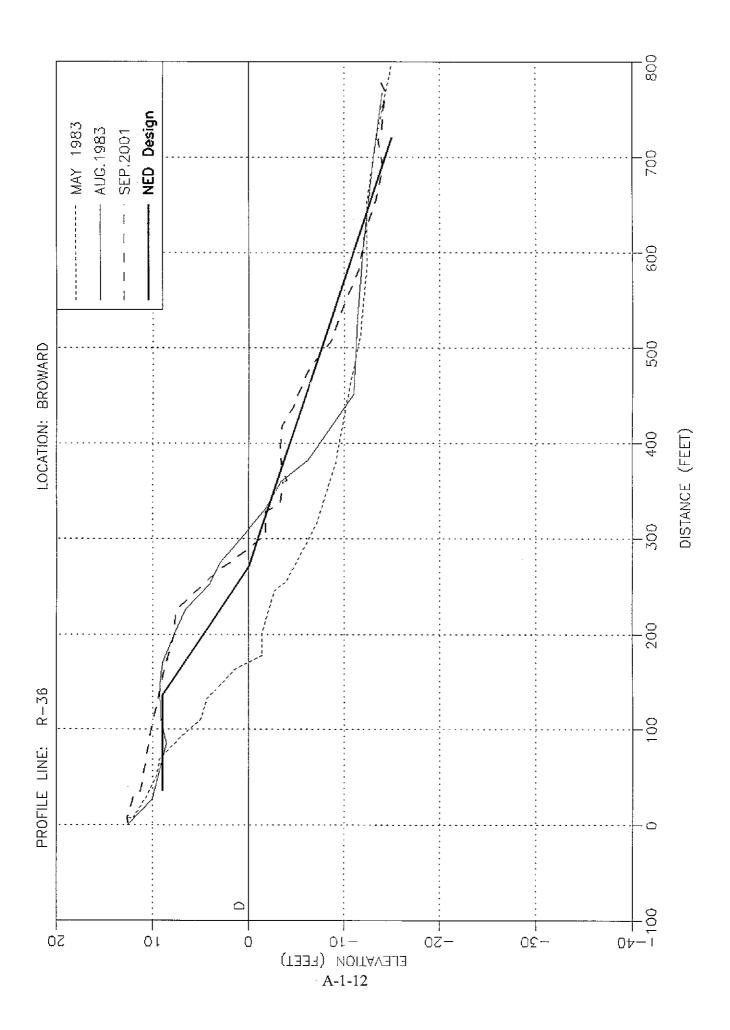


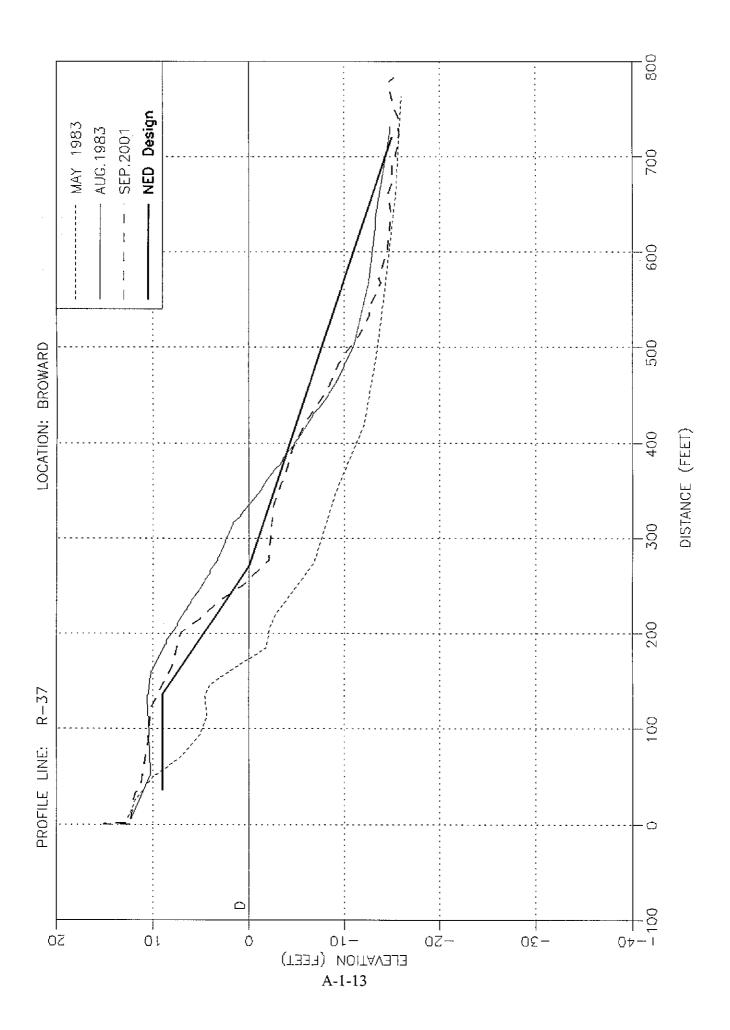


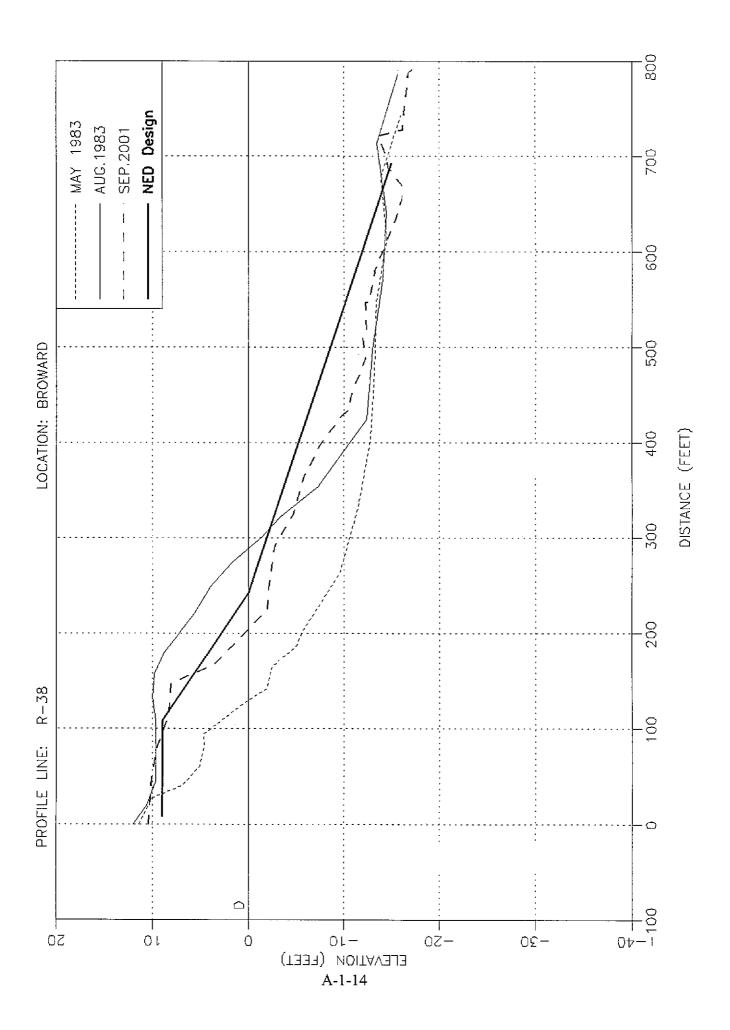


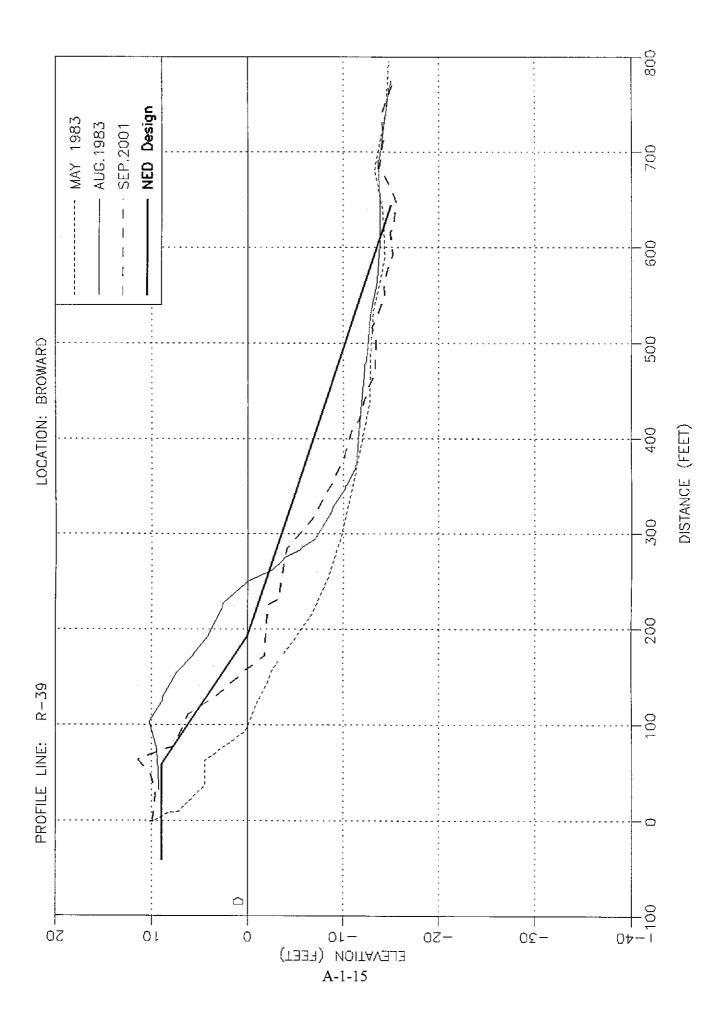


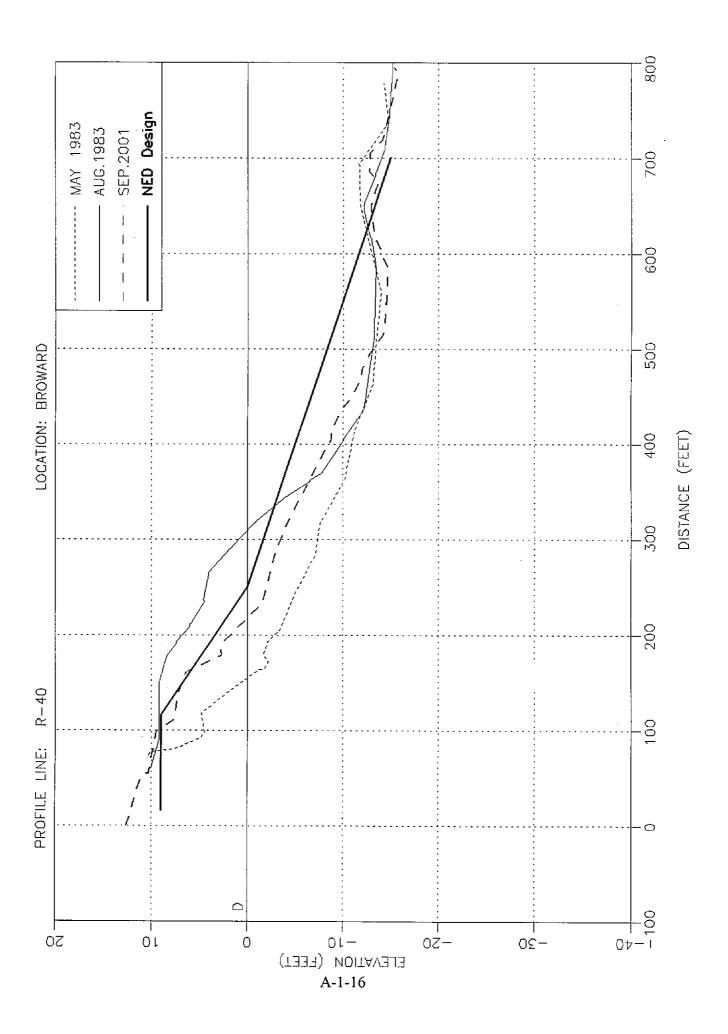


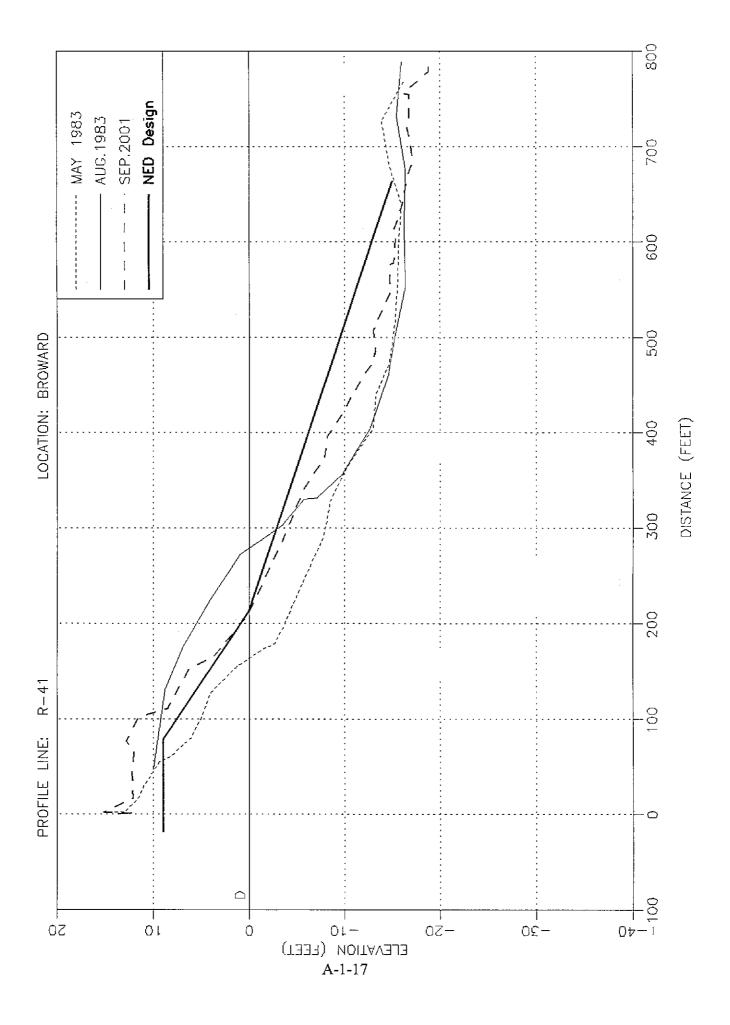


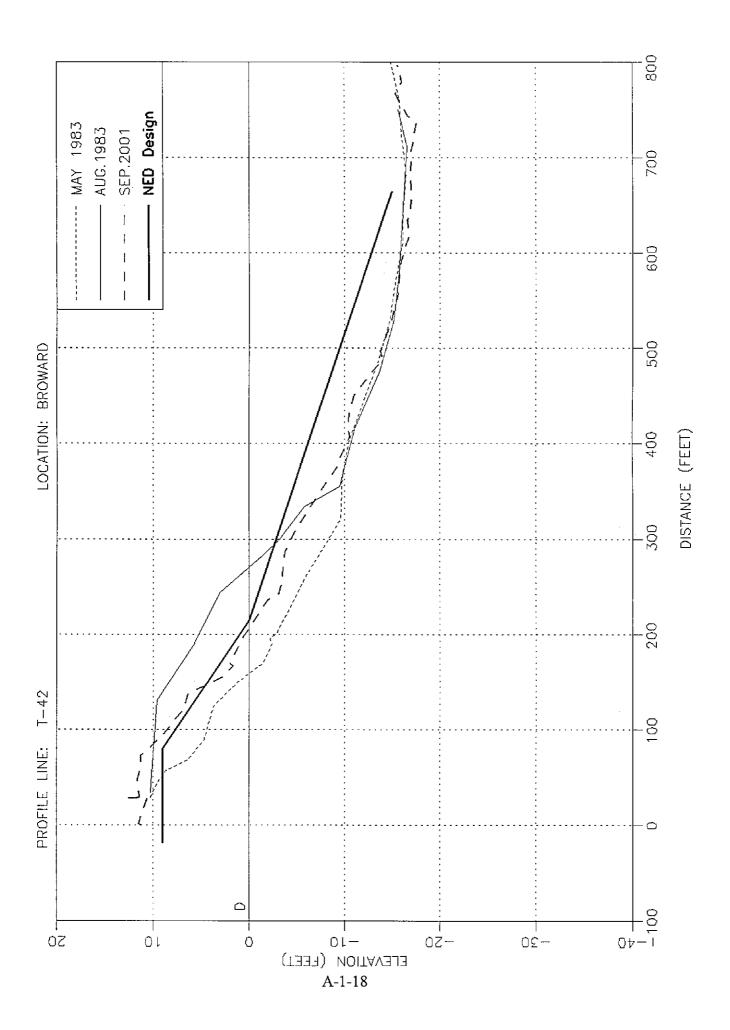


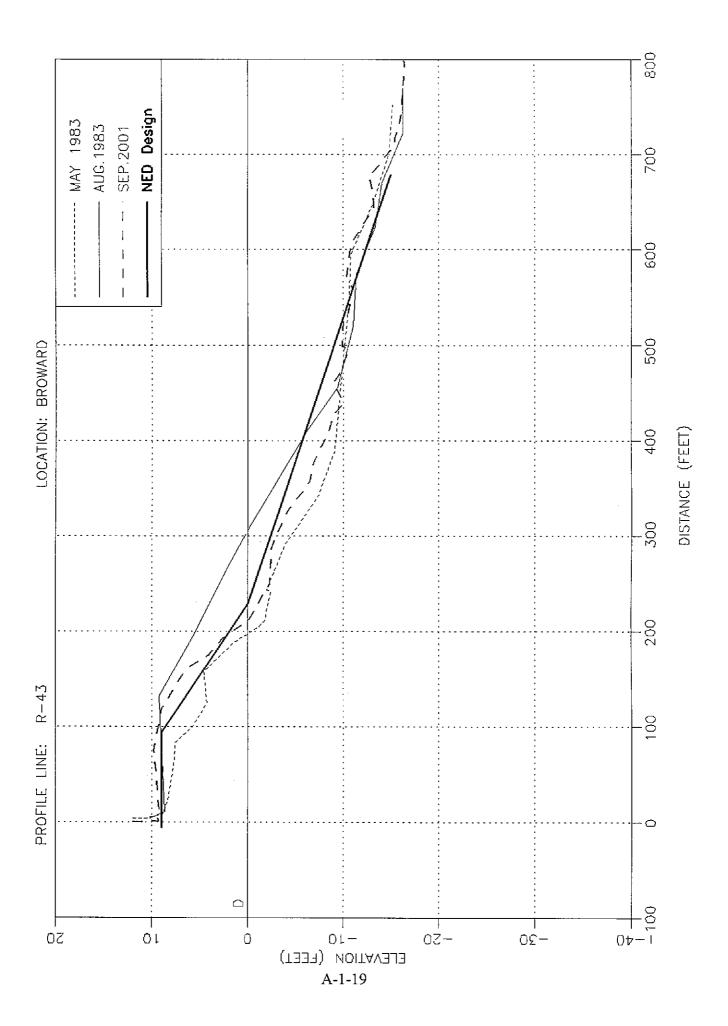


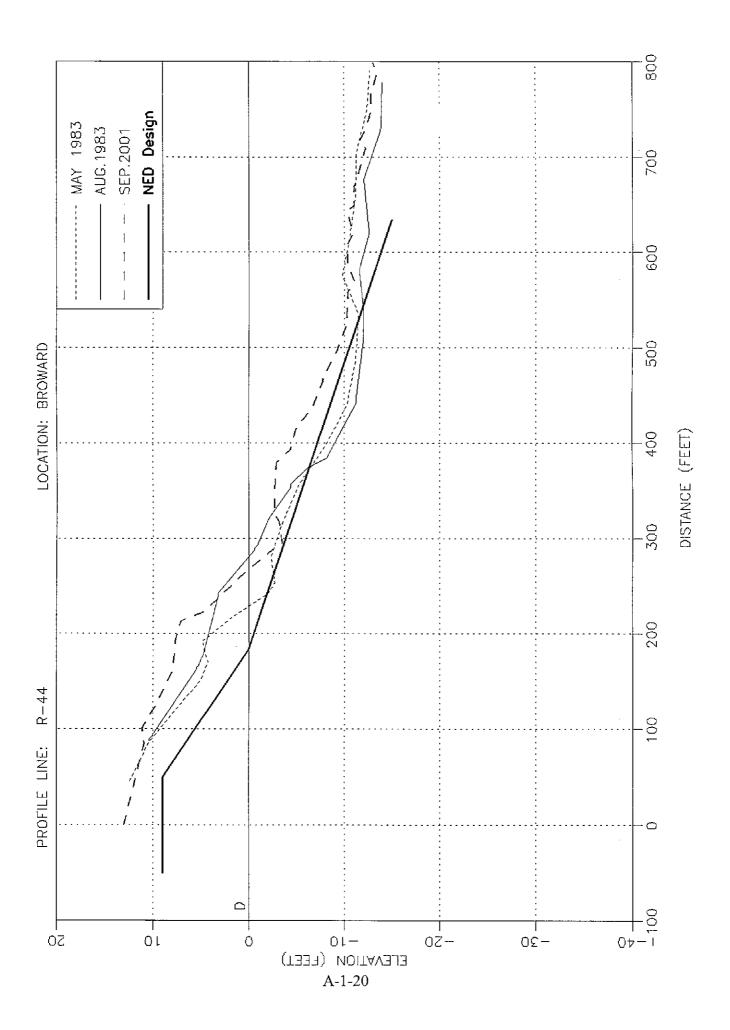


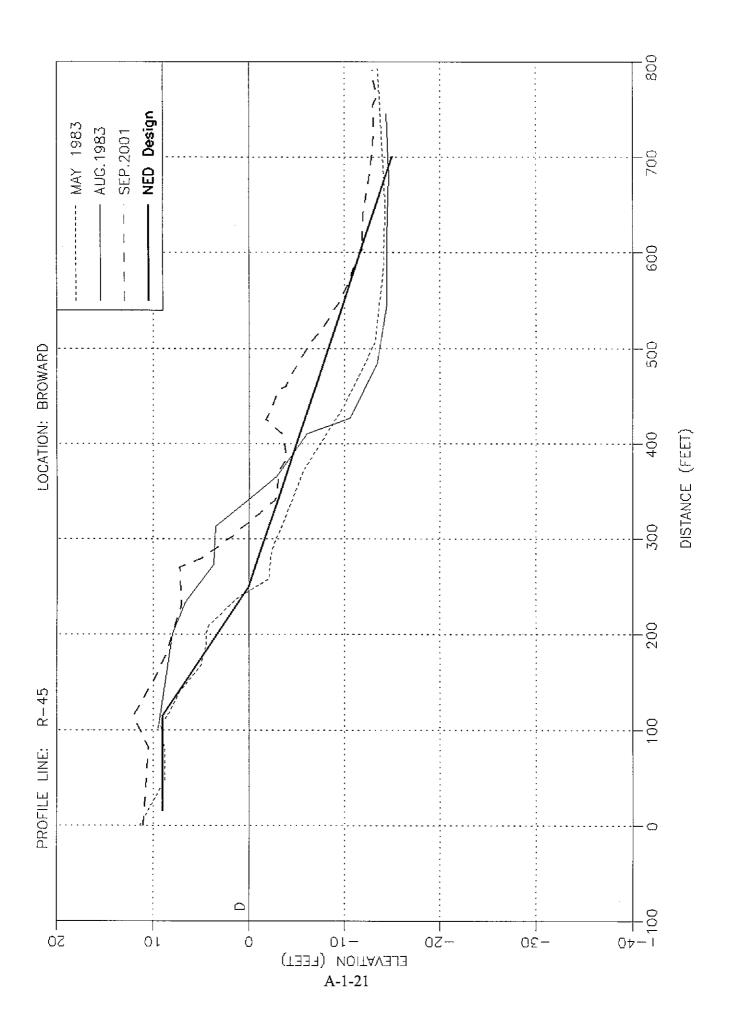


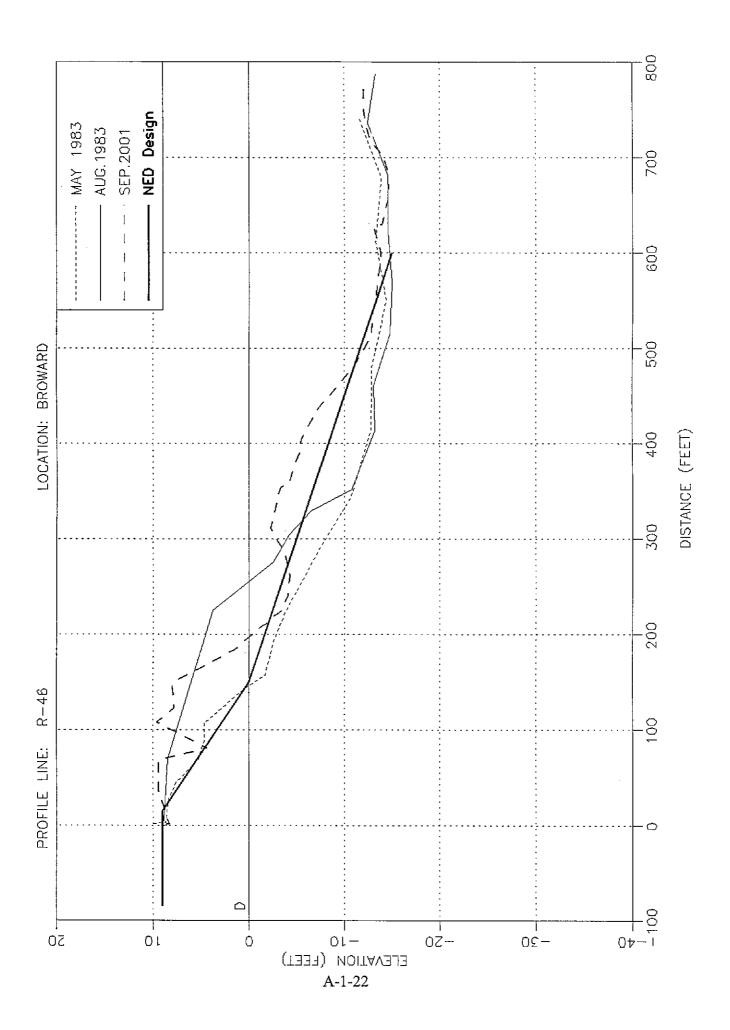


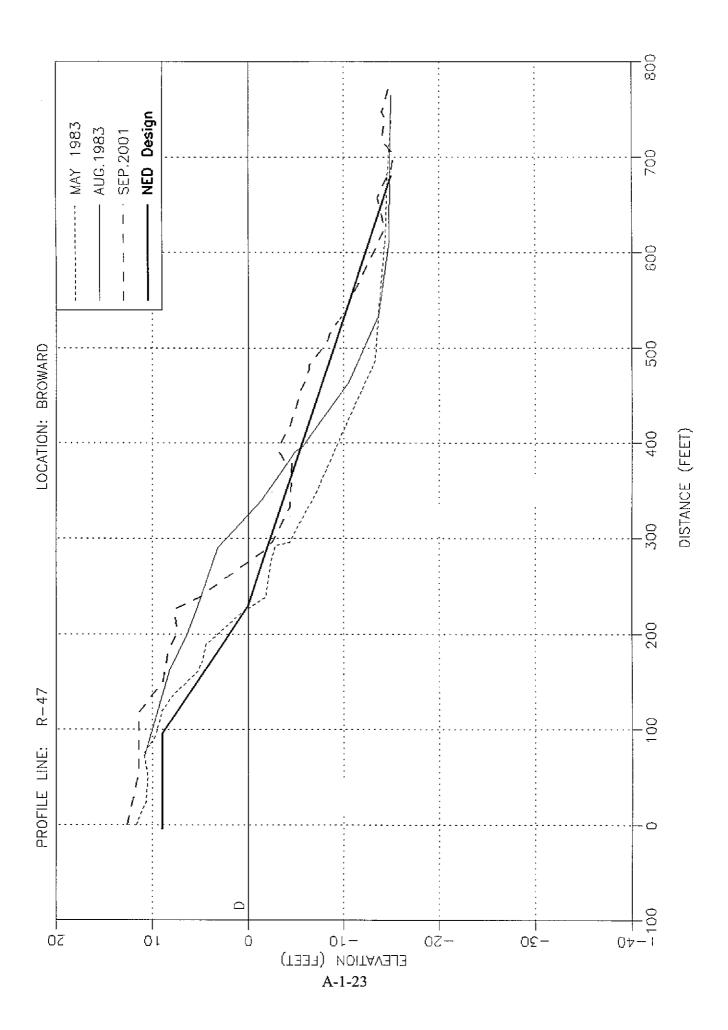


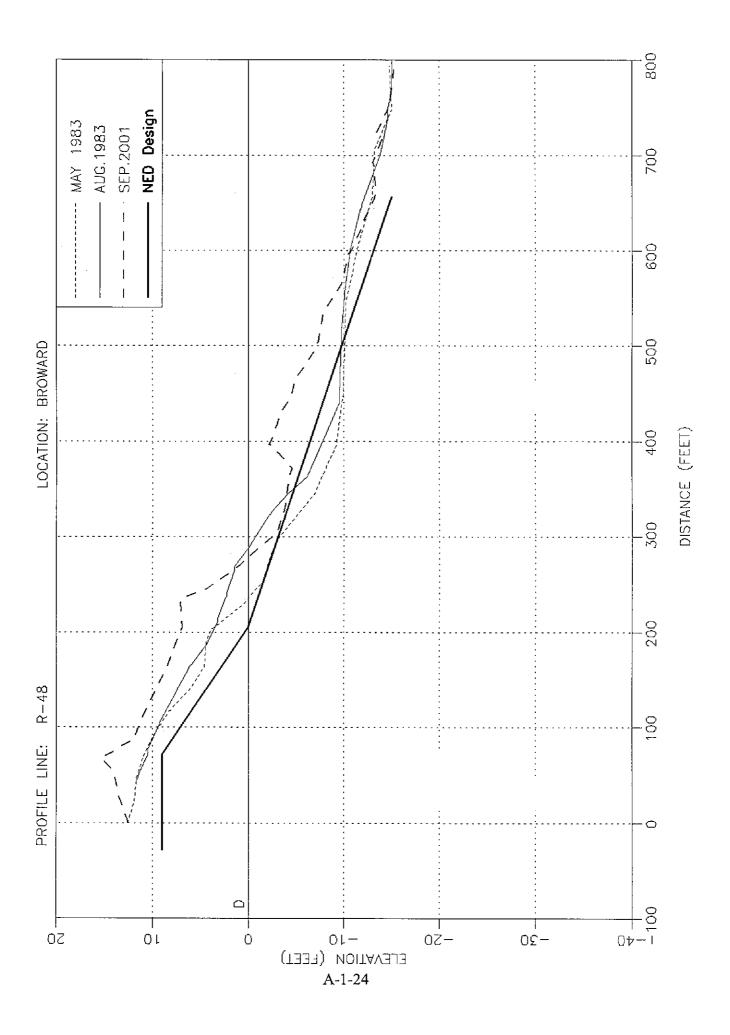


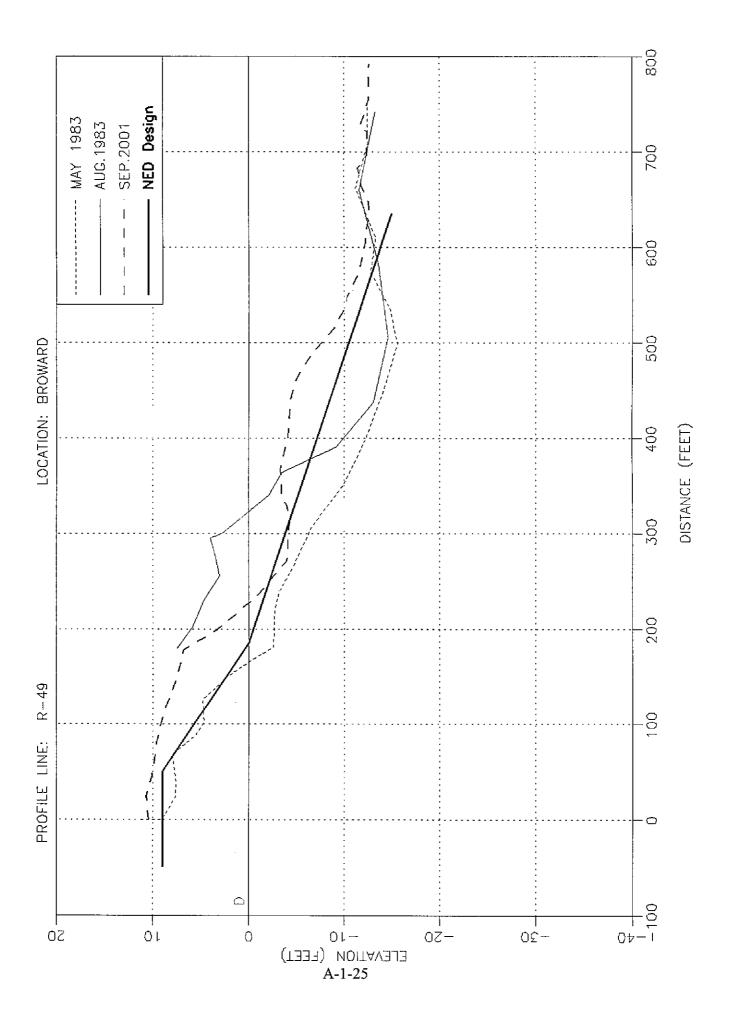


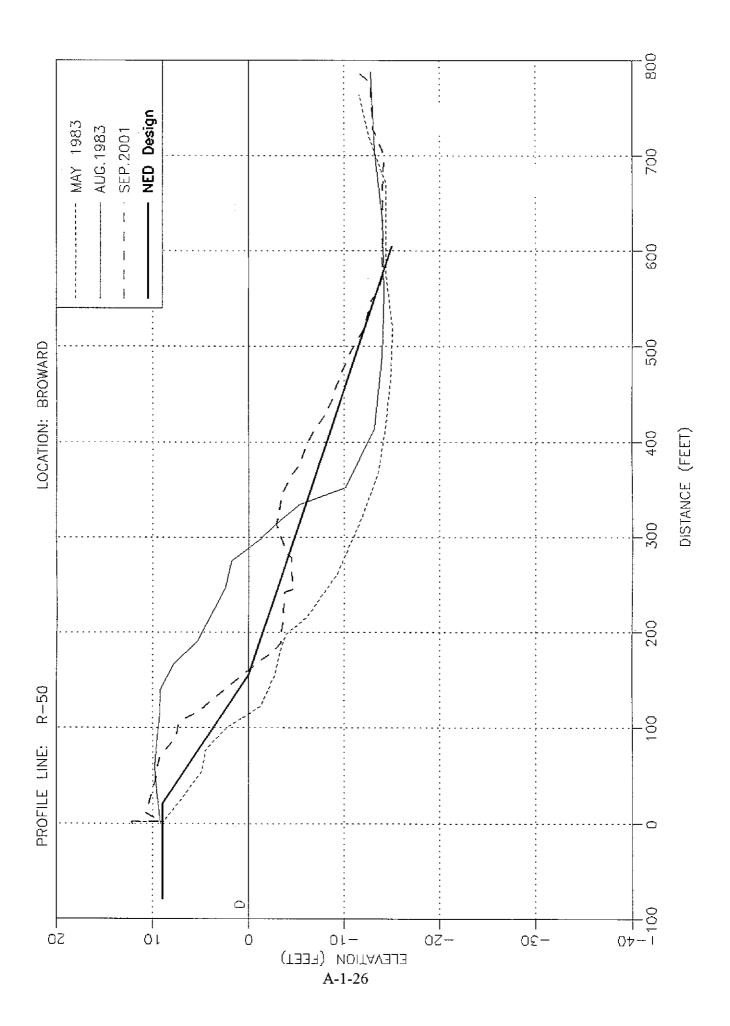


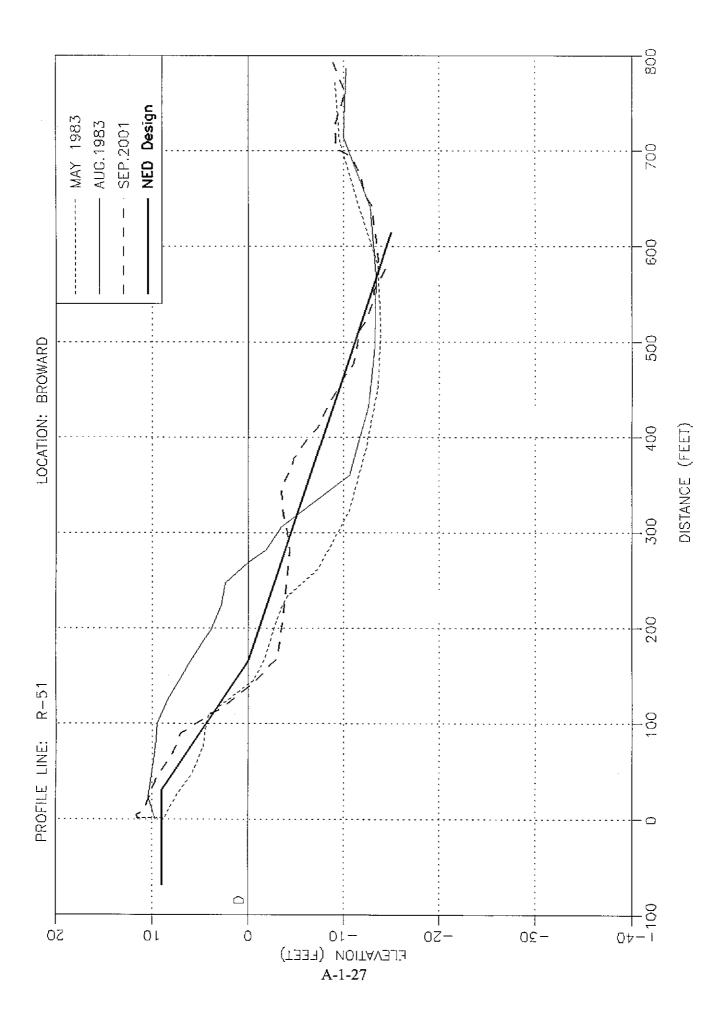


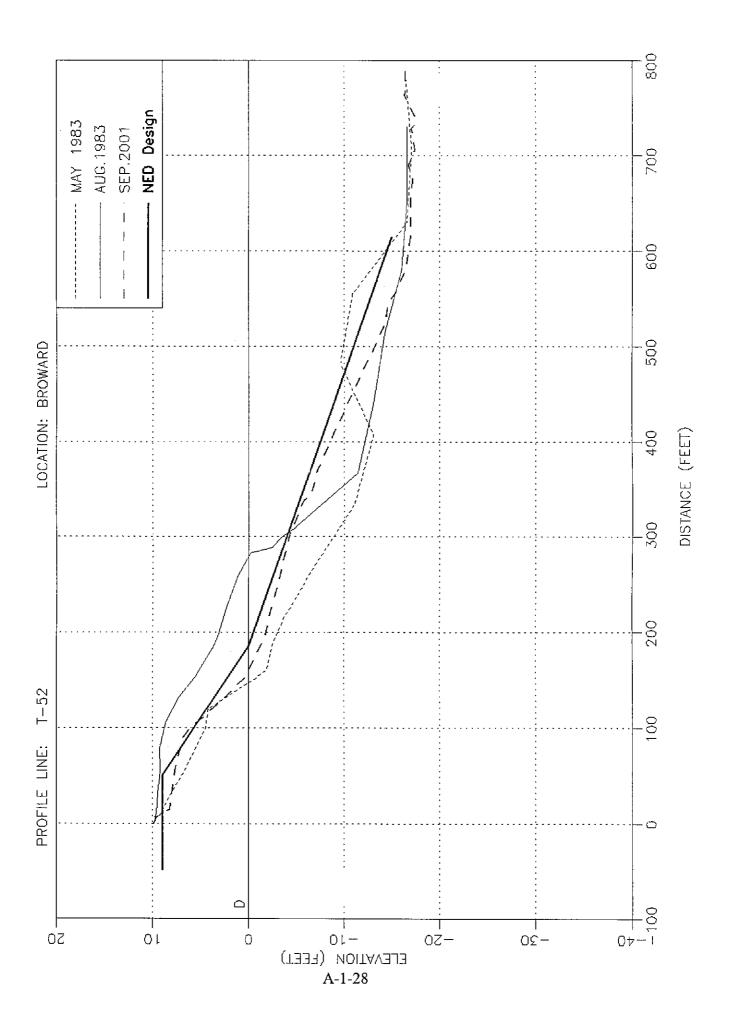


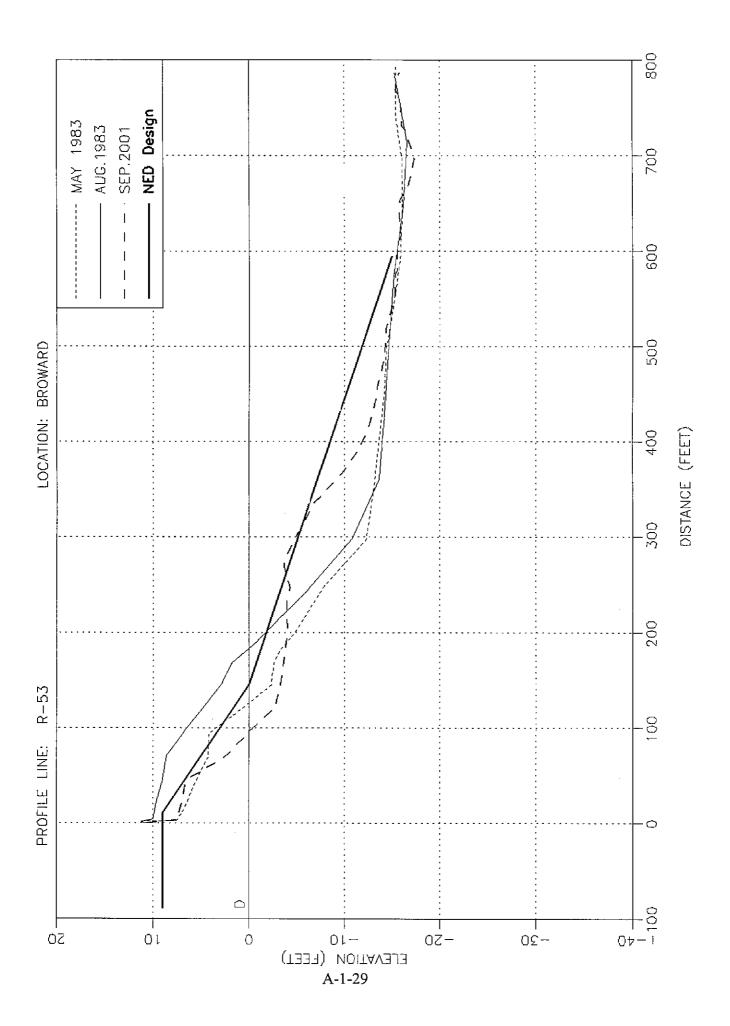






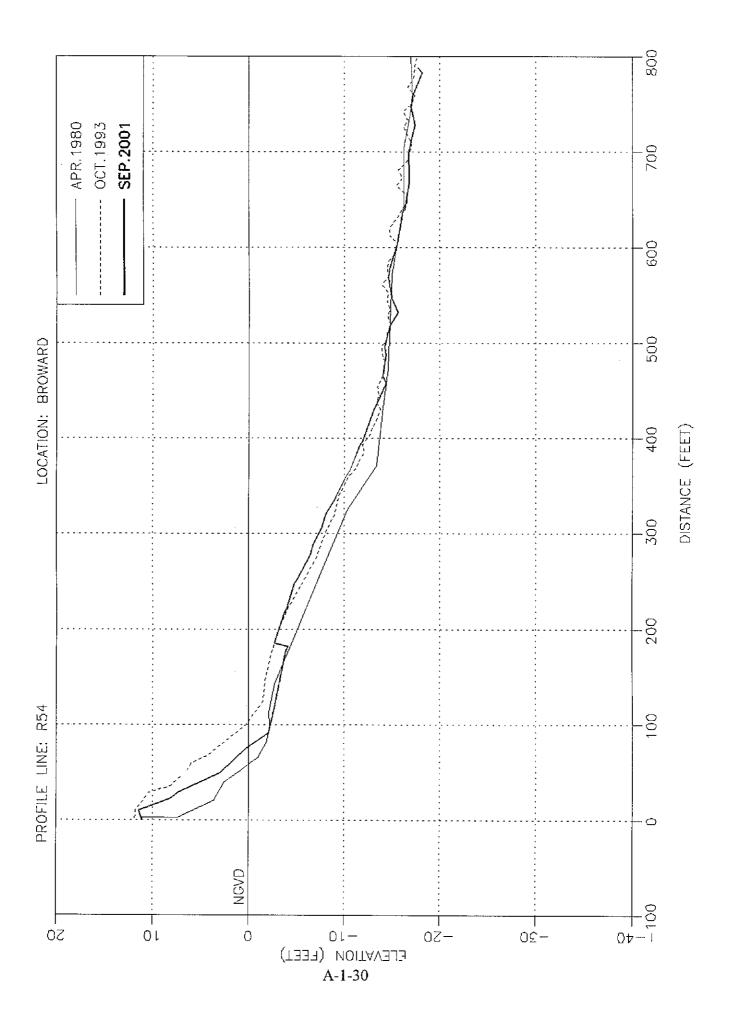


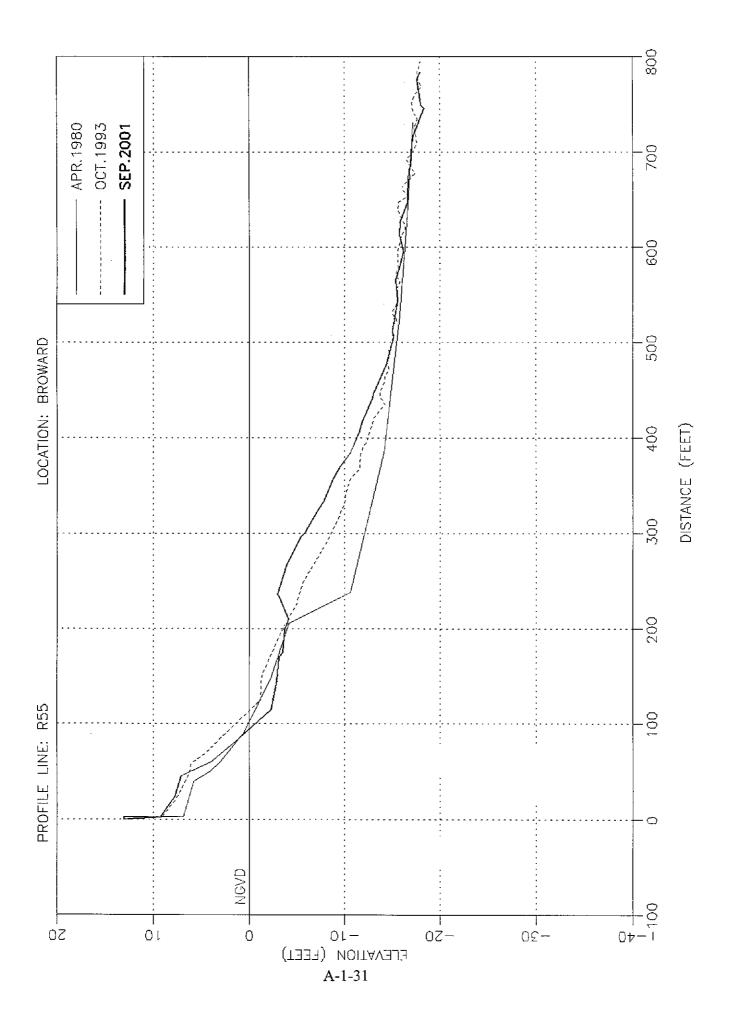


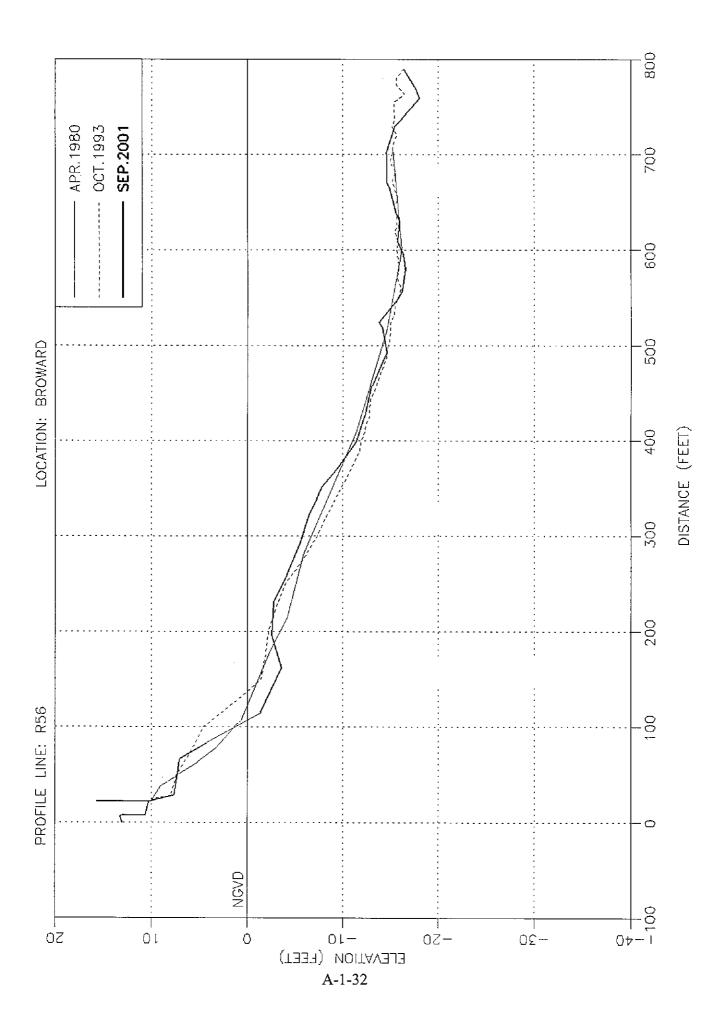


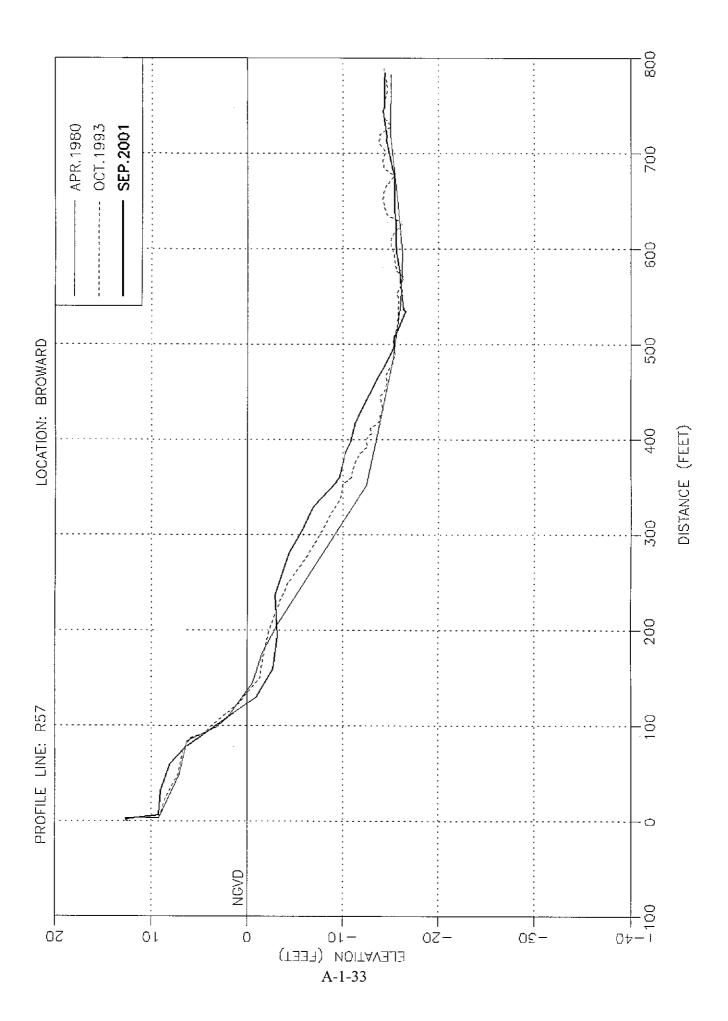
FORT LAUDERDALE

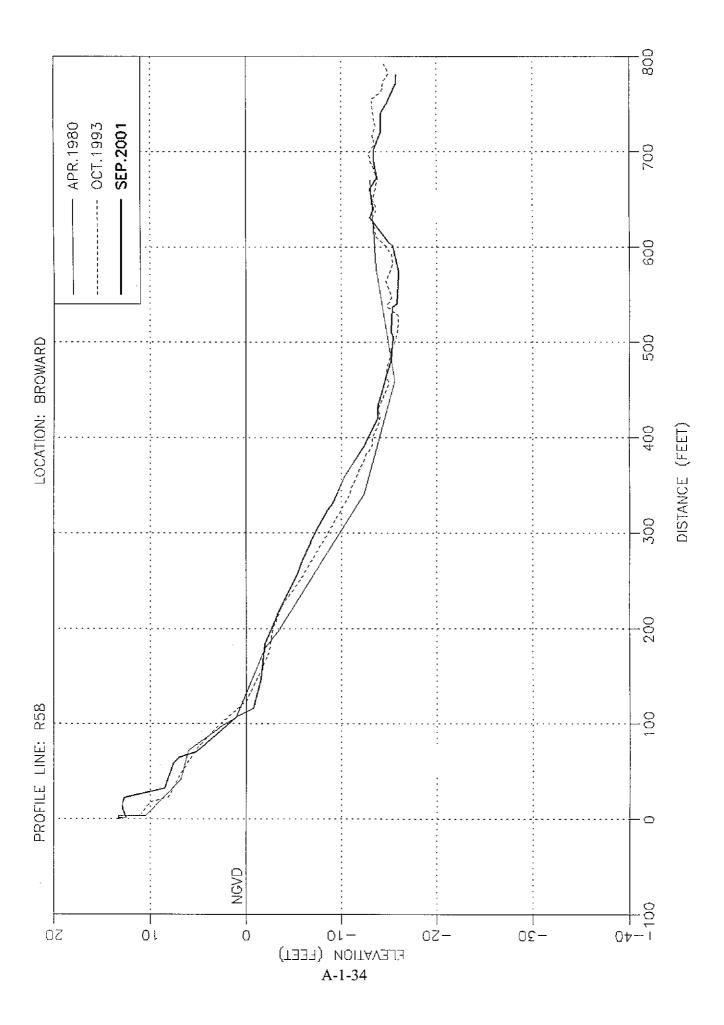
TYPICAL PROJECT CROSS-SECTIONS

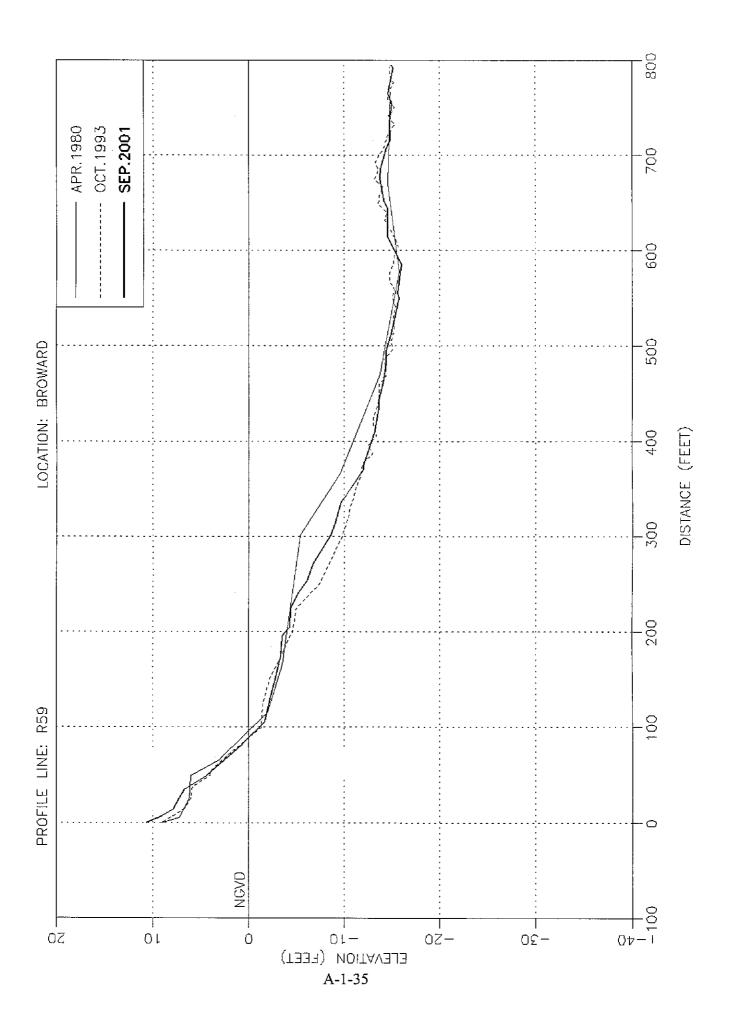


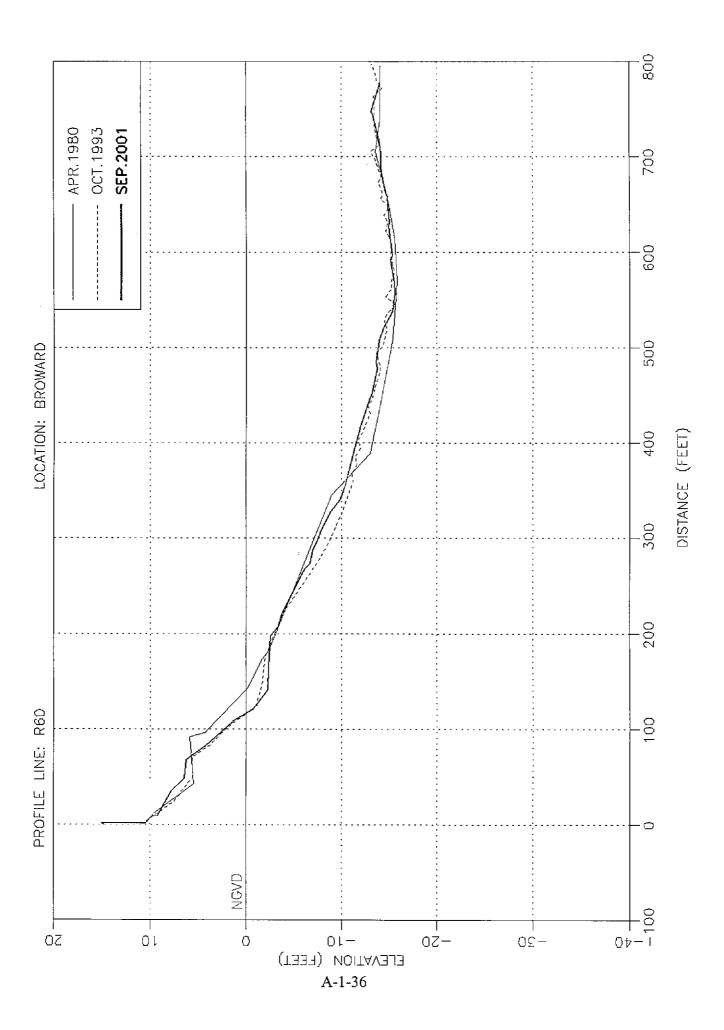


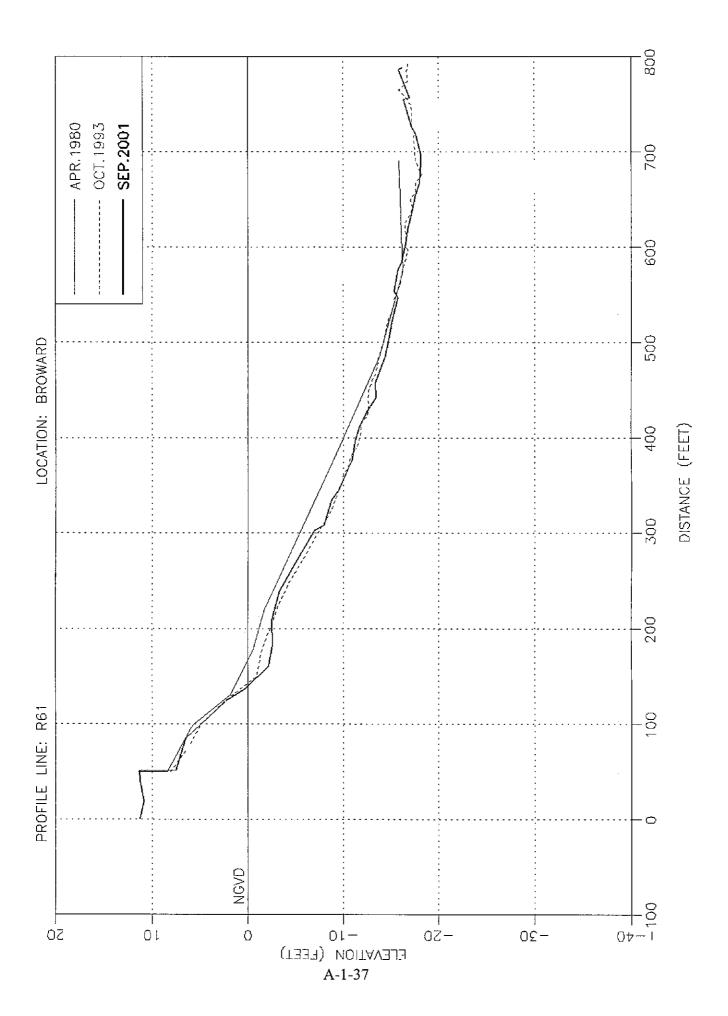


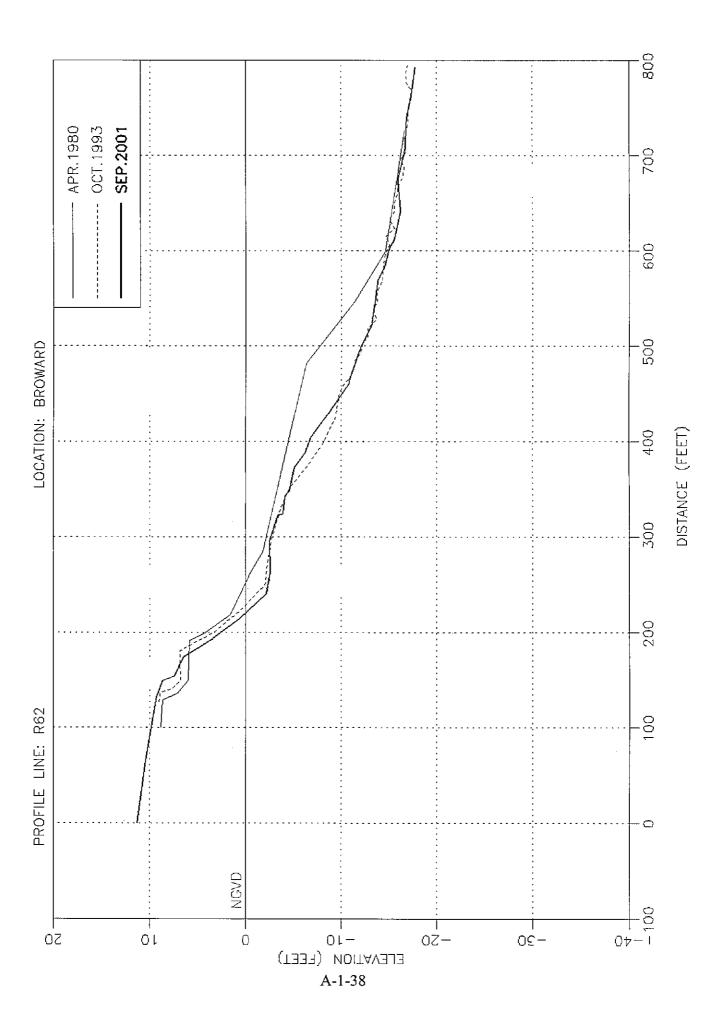


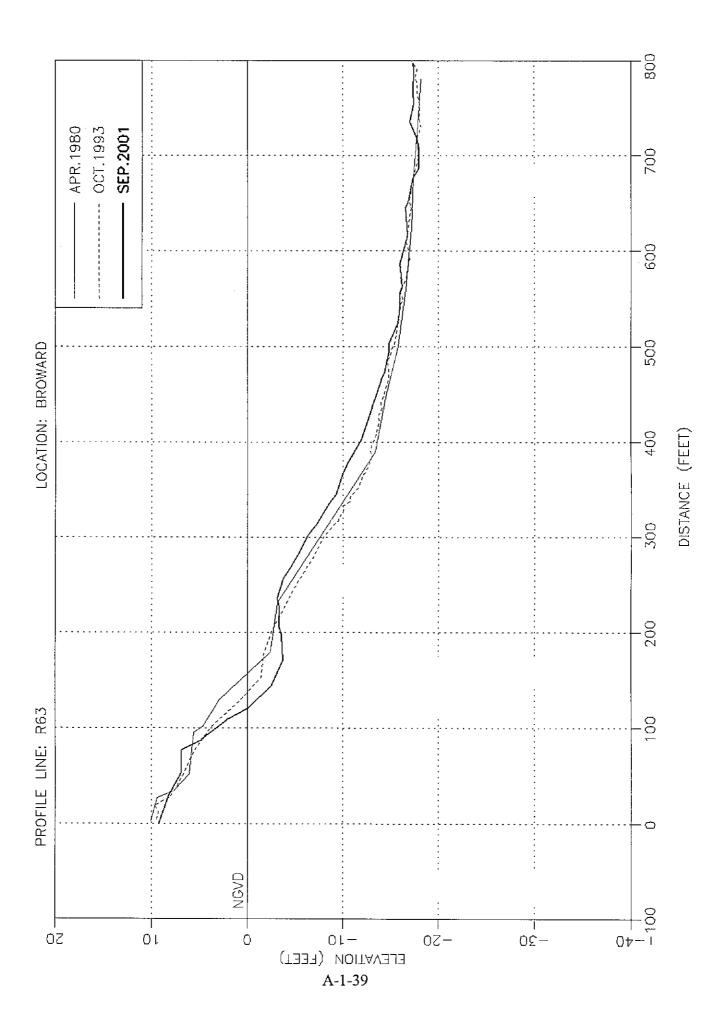


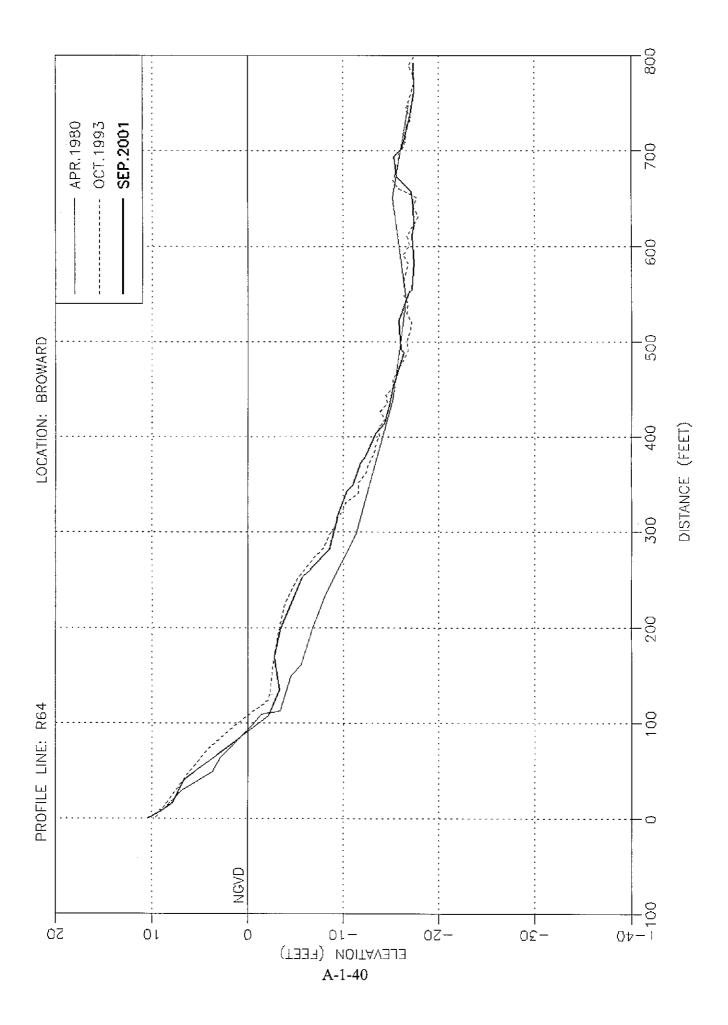


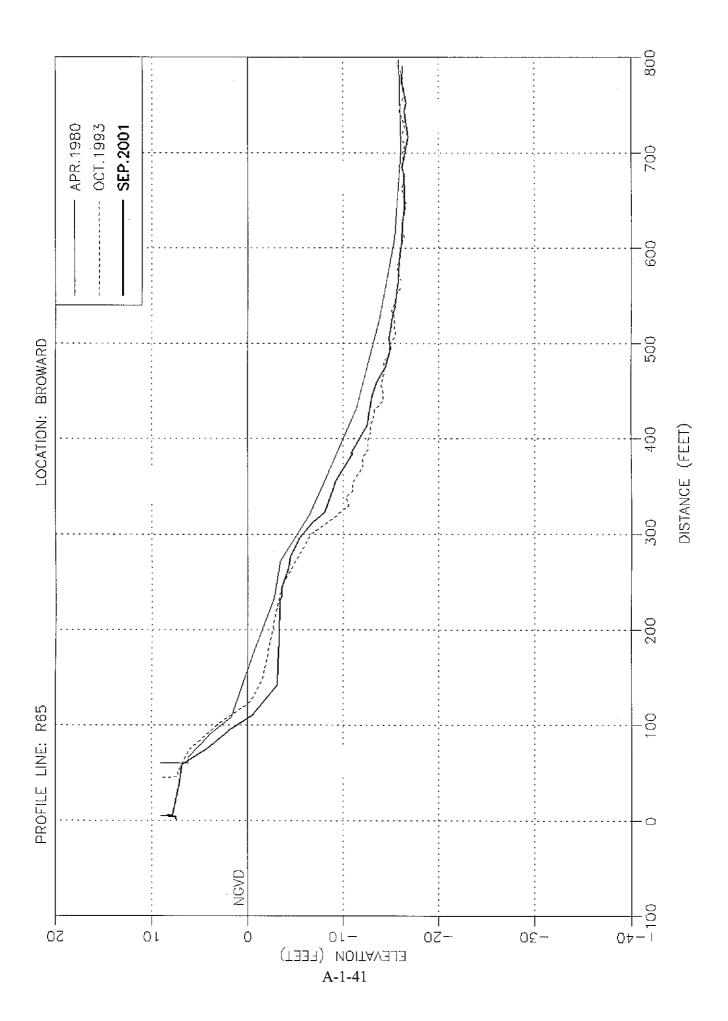


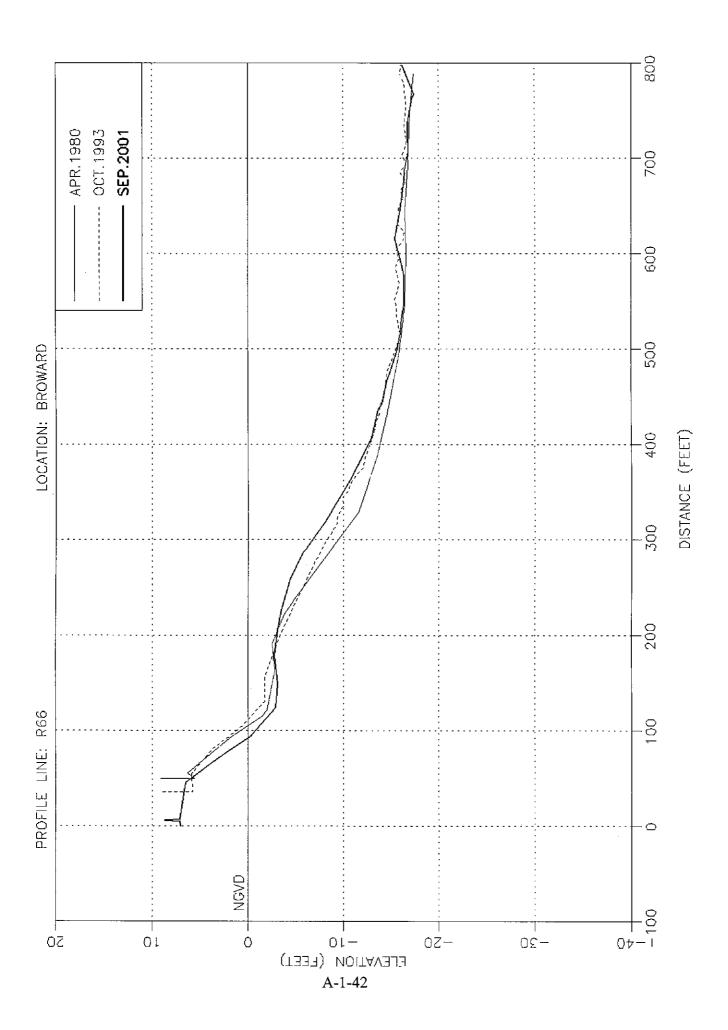


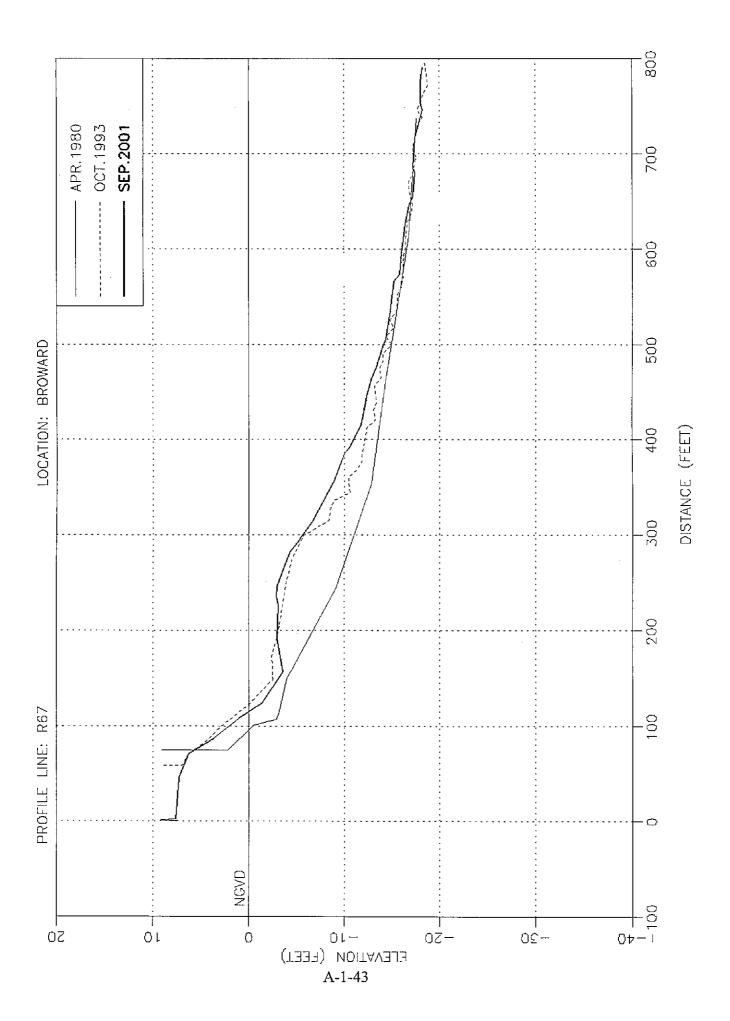


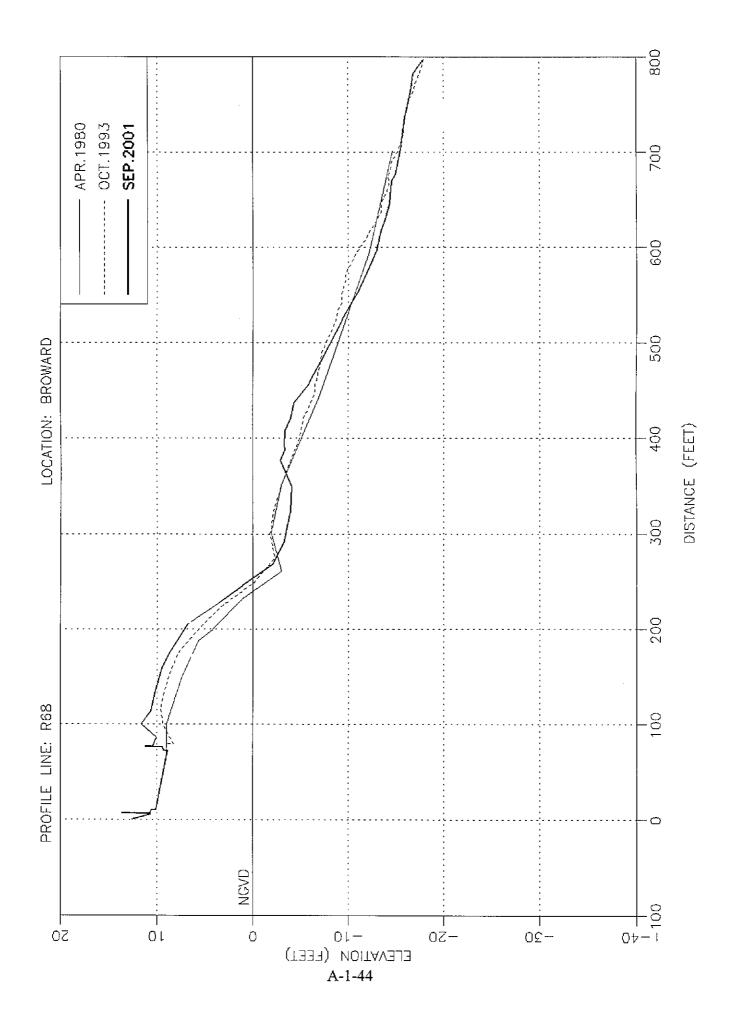


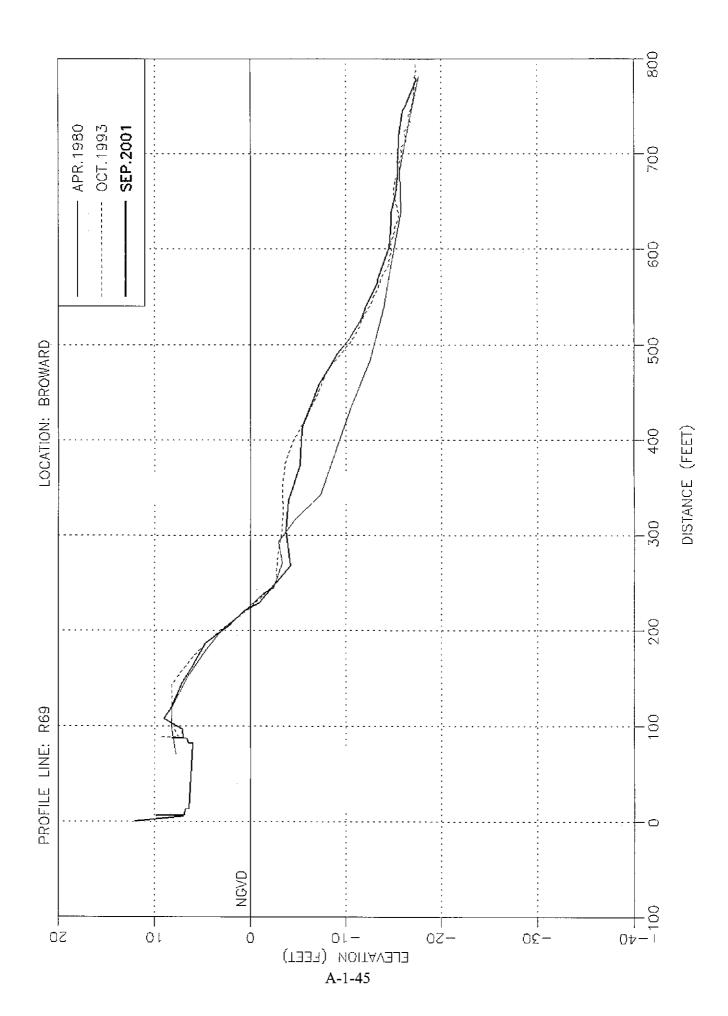


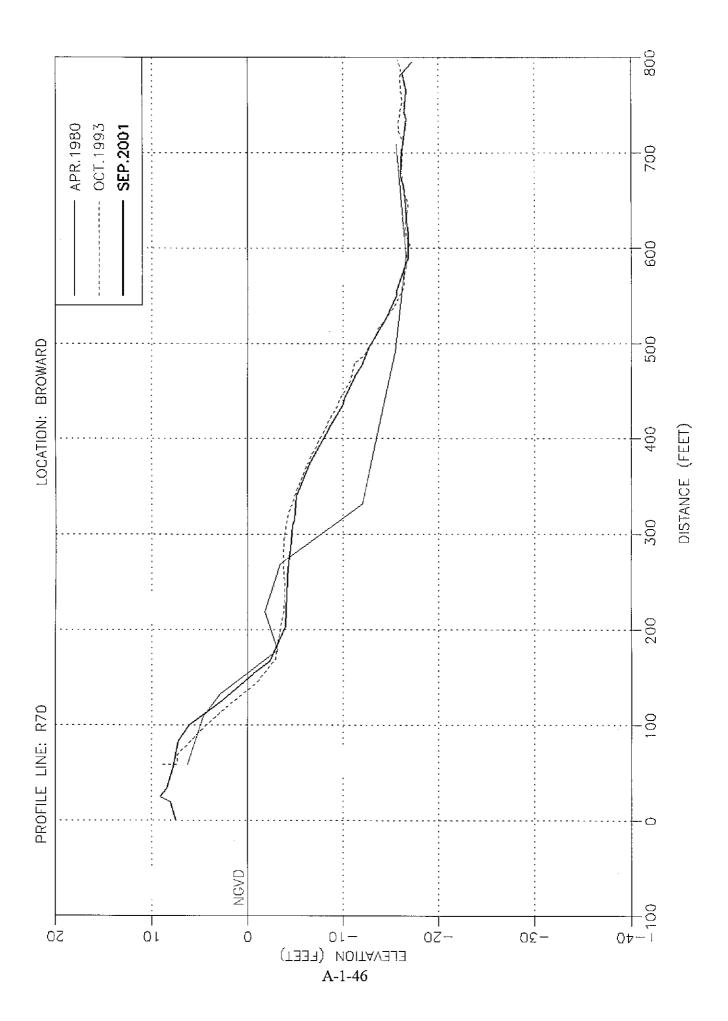


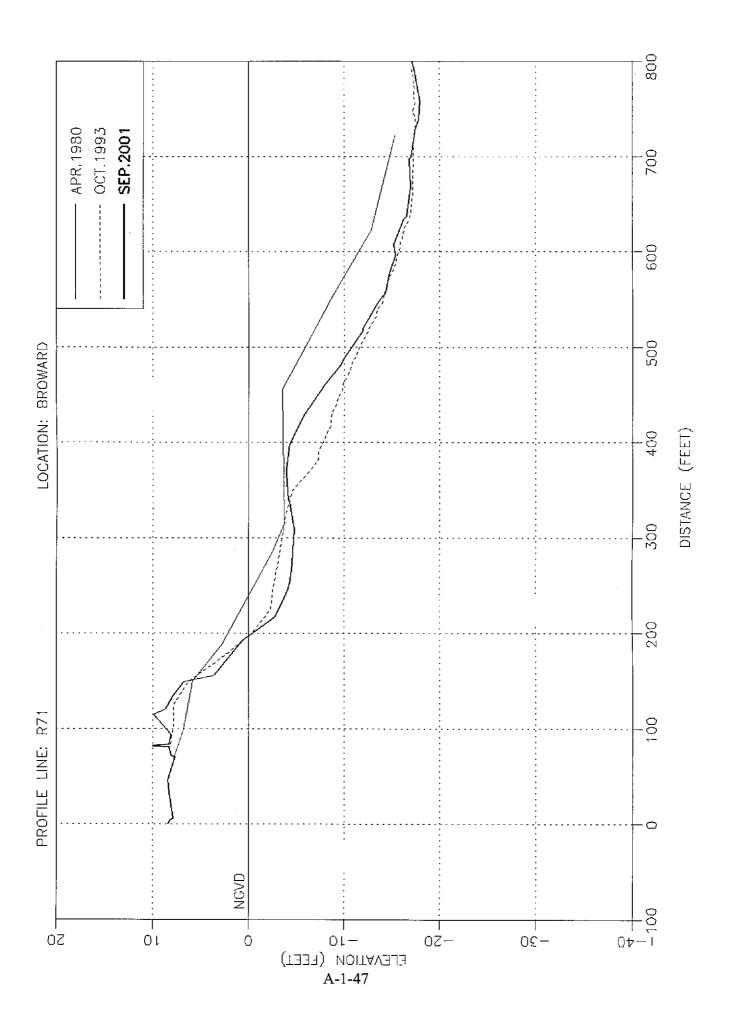


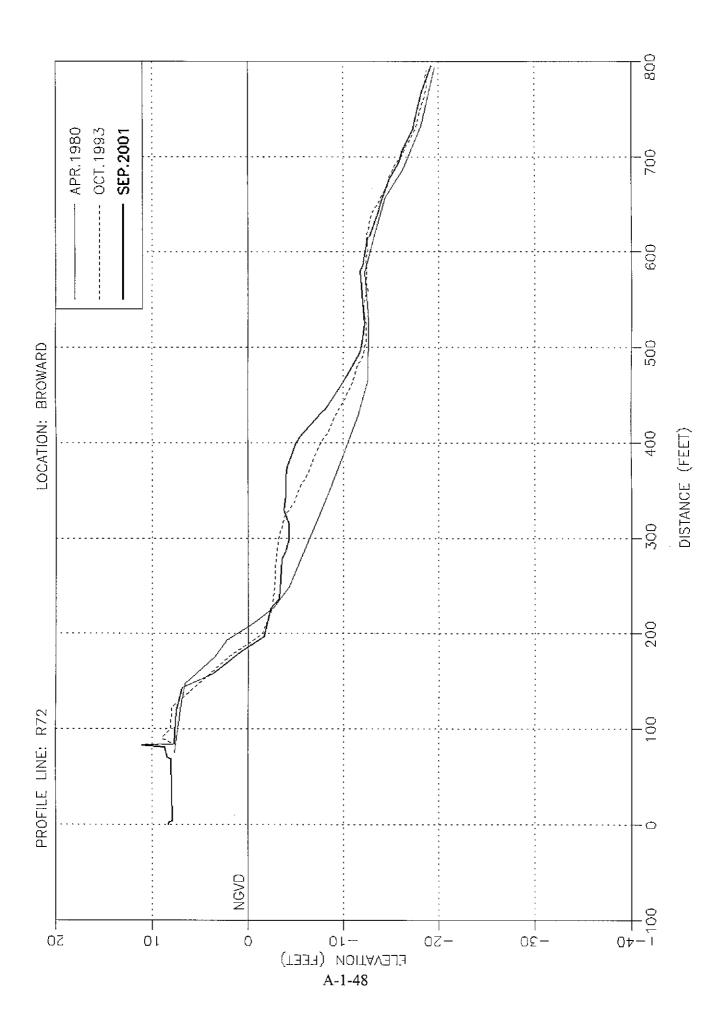


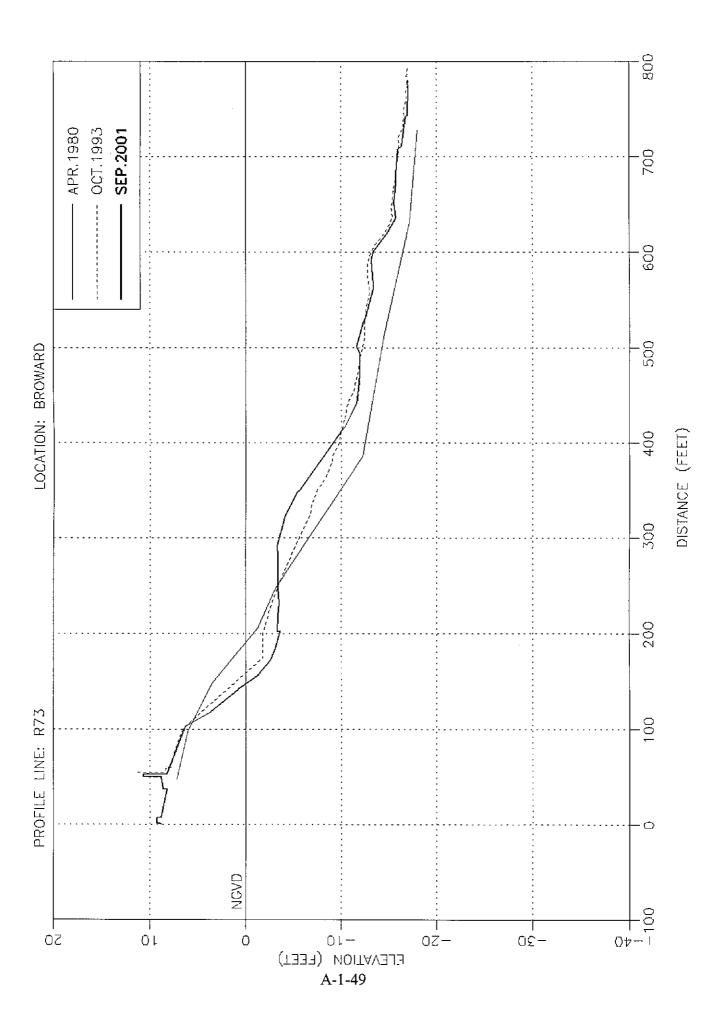


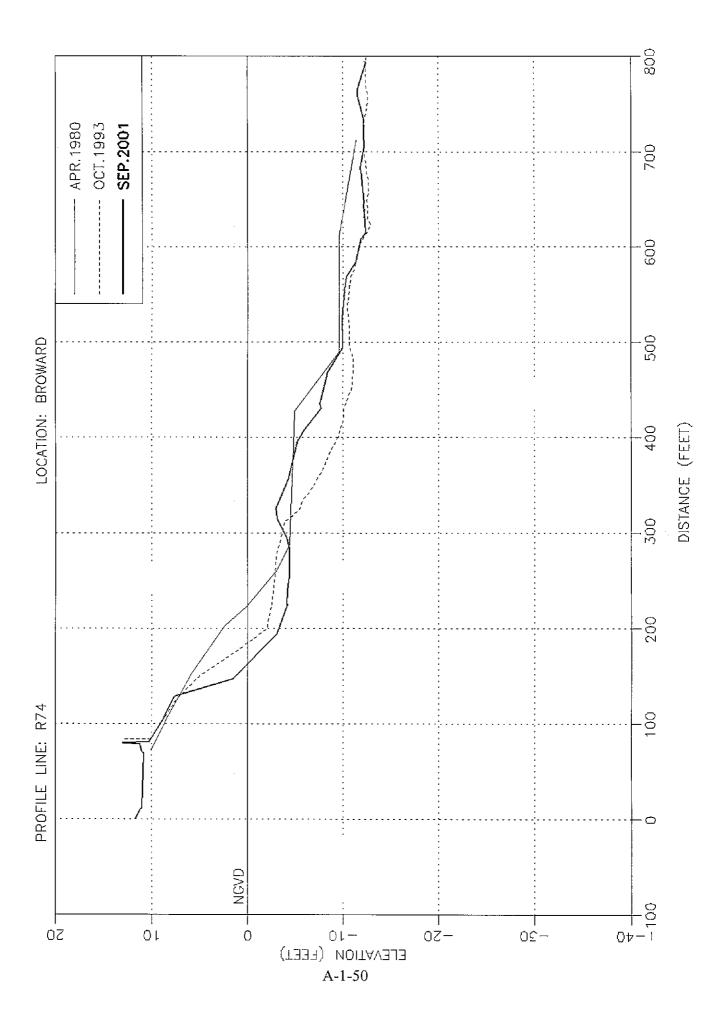












SUB-APPENDIX A-2

DETAILED COST ESTIMATES FOR RE-EVALUATING THE FEDERAL PROJECT WIDTH

Pompano Beach to Lauderdale by the Sea

ECL/Baseline Extension (ft)	Nourishment Interval (yrs)	Annualized Costs	Primary Benefits (mean)	Net Benefits
75	5	\$3,516,000	\$24,636,000	\$21,120,000
100	5	\$3,984,000	\$25,258,000	\$21,274,000
125	5	\$4,530,000	\$25,618,000	\$21,088,000

Sub-Appendix A-2
Re-Evaluation of the Federal Project
Optimization Summary

ECL/Baseline Extension (ft)	Nourishment Interval (yrs)	Annualized Costs
75	4	\$3,523,000
75	5	\$3,516,000
75	6	\$3,528,000
100	4	\$3,991,000
100	5	\$3,984,000
100	6	\$3,995,000
125	4	\$4,535,000
125	5	\$4,530,000
125	6	\$4,531,000

Estimate of Contract and Constitution Costs Pompand Baach Lauderon elby the Sea 70 Auded Shirveline W (b. (f) 4 Year Renous ment releval Project Life: 50 yrs

Item	Project Year	Unil Cast	Ountify	0	4		12	16	Renouri 20	shment at Indica 24	led Year 28	32	36	40	44	48
Nourishment Mobilization/Dervobilization	a	\$1,000,000	1	51,000,000												
Boach Fill		\$6 50	2,605,628	\$16,936,579												
Beach Tilling (ac) Hard Bottom Mitigation (ac)		\$300 \$300,000	64.7 6.5	\$19,396 \$1,950 030												
Ist Renourishment	4	4004,000	6.5	31.230 230												
Mobilization/Demobilization		\$1,000,000	1		\$1,000,000											
Beach Fill Beach Taling (ac)		\$6 50 \$300	748,320 64.7		\$4,864,080 \$19,396											
Hard Bottom Mitigation (ac)			•		\$0											
2nd Renounshment	8					*										
Mobilization/Demobilization Beach Fill		\$1,000,000 \$6.50	1 748,320			\$1,000,000 \$4,864,080										
Beach Titling (ac)		\$300	64.7			519,396										
Hard Bottom Mitigation (ac) 3rd Renounshment	12					\$0										
Mobilization/Demobilization	·-	\$1,000,000	1				\$1,000,000									
Beach Fill Beach Tilling (ac)		\$6 50 \$300	748,320 64.7				\$4,864,080 \$18,396									
Hard Bottom Mitigation (ac)		2500	04.7				\$18,386									
4th Renourishment	15															
Mobilization/Demobilization Beach Fill		\$1,000,000 \$6.50	748,320					\$1,000,000 \$4,664,000								
Beach Tilling (ac)		\$300	64.7					\$19,398								
Hard Bottom Mitigation (ac) 5th Renourshment	20							\$0								
Mobilization/Demobilization	20	\$1,000,000	11						\$1,000,000							
Beach Fill		\$6.50	748,320						\$4,864,080							
Beach Tilling (ac) Hard Bottom Mitgetion (ac)		\$300	54.7						\$19,396 \$0							
60: Renourishment	24								J u							
Mobilization/Demobilization		\$1,000,000	1							\$1,000,000						
Beach Fill Beach Tilling (ac)		\$6.50 \$300	748,320 54.7							\$4,864,080 \$19,396						
Hard Bottom M-tigation (ac)		+vu								\$0						
7th Renourishment	28	\$1.000.000									* 1 oc					
Mobilization/Demobilization Beach Fill		\$1,000,000 \$6.50	748,320								\$1,000,000 \$4,864,080					
Beach Tilling (ac)		\$300	64.7								519,396					
Hard Bottom Mitigation (ac) 819 Renourishment	32										\$ C					
Mobilization/Oemobilization	34	\$1,000,000	1									\$1,000,000				
Beach Fall		58,50	748,320									\$6,350,720				
Beach Tilling (ac) Hard Bottom Mitigation (ac)		\$300	64 7									\$19,396 \$0				
9th Renourshment	36											şu.				
Mobilization/Demobilization		\$1,000,000	1										\$1,000,000			
Beach Fill Beach Tilling (ac)		\$8 50 \$300	748,320 64,7										\$6,360,720 \$19,395			
Hard Bottom Mitigation (ac)													\$0			
13th Renourishment	40	_														
Medilization/Demobilization Beach Fill		\$1,000,000 \$8.50	746,320											\$1,000,000 \$8,350,720		
Beach Tilling (ac)		\$300	64,7											\$19,396		
Hard Bottom Mitigation (ac)														\$0		
11th Renoulishment Mobilization/Demobilization	44	\$1,000,000	1												\$1,000,000	
Beach Fill		\$8,50	748,320												\$6,360,720	
Beach Tilling (ac)		\$300	64 7												\$19,396	
Hard Bottom Mitigation (ac) 12th Renounshment	48														\$ 0	
Mobilization/Demobilization		\$1,000,000	1													\$1,000,000
'Seach Fill Beach Tilling (ac)		\$8 50 \$300	374,160 55.0													\$3,180,360 \$16,760
Hard Bottom Mitigation (ac)			20.0													50
Subtotal		450		\$19,905,975	\$5,882,475	\$5,883,476 \$882,521	\$5,583,476	\$5.683,476	\$5,863,476	\$5,383,476	\$5,683,475	\$7,380,116	\$7,380,116	\$7,383,116	\$7,380,118	\$4,197,120
Confingency Subjetal Contract Cost							5882,521	\$932,521							\$1,107,017	
		15%		52 585 886 .522 891 871	\$882,521 \$6,765,998	\$6,765,998	38.785.995	56 785 998	\$882.521 \$6.765.008	\$882,521	\$682.521 \$6.765.998	\$1,107.017 \$3,497.134	\$1,107,017	\$1.107.017	\$8.457.134	\$629,568
				-\$22,891,871	\$6,765,998	\$6,765,998	\$8,765,995	\$6.785.998	\$6,765,998	\$882,521 \$6,765,998	\$682.521 \$6,765,998	\$8,487,134	\$8,487,134	58 487 134	\$8,467,134	\$629,568 \$4,826,688
Hourshment		ntage of Contract	Costs		\$6,765,998	\$6,765,996	\$6,765,998	\$6,785,998	\$6,765,998	\$882,521 \$6,765,998	\$882.521 \$6,765,998	\$3,497,134	\$8,487,134	58 487.134	\$8,467,134	\$629,568 \$4,826,688
Hourishment E&D+S&A	Perce 0		Cosis 1		\$6,765,998	\$6,765,998	\$6,765,995	\$6,785,998	\$6,765,998	\$882,521 \$6,765,998	\$682.521 \$6,765,998	\$8,487,134	\$6,487,134	58 487.134	\$8,467,134	\$629,568 \$4,826,688
E&D+S&A 1st Renounshment		ntage of Contract 10%	1	-\$22,891,871	\$6,765,998	\$6,765,998	\$6,765,998	\$6,785,998	\$6,765,998	\$882,521 \$6,795,998	\$882.521 \$6,765,998	\$8,487,134	\$6,487,134	58 487.134	\$8,467,134	\$629,568 \$4,826,686
E&D+S&A 1st Ranounshment E&D+S&A	4	ntage of Contract		-\$22,891,871	\$6,765,998	\$6,765,996	\$6,785,998	\$6,785,998	\$6,765,998	\$882,521 \$6,765,998	\$682,621 \$6,765,998	\$3,497,134	\$6,487,134	58 487.134	\$8,467,134	\$629,568 \$4,826,688
E&D+S&A 1st Renounshment E&D+S&A 2nd Renourishment E&D+S&A	0 4 8	ntage of Contract 10%	1	-\$22,891,871	\$6,765,998	\$6,765,996	\$6,785,998	\$6.785,998	\$6,765,998	\$882,521 \$6,765,998	\$682,621 \$6,765,998	\$8,487,134	\$8,487,134	59 487.134	\$8,467,134	\$629,568 \$4,826,688
E&D+G&A 1st Renounshment	4	ntage of Contract 10% 20% 20%	1	-\$22,891,871	\$6,765,998	\$6,765,996	\$6,766,998	\$6.785.99 8	\$6,765,998	\$882,521 \$6,765,998	\$882,521 \$6,765,998	\$3,487,124	\$8,487,134	59 497.134	\$6,467,134	\$628,568 \$4,826,688
E&D+G&A 1st Renoumshment E&D+S&A 2nd Renoumshment E&D+S&A 3rd Renoumshment E&D+G&A	0 4 8 12	ntage of Contract 10% 20%	1	-\$22,891,871	\$6,765,998	\$6,765,996	\$6,765,998 \$1,353,200	\$6.765.938	\$6,765,998	\$682,521 \$6,765,996	\$682.521 \$6,765,998	53,487,134	\$8,487,134	59 497.134	\$8,457,134	\$629,566 \$4,826,686
ESD-GSA 1at Renourshment ESD+SSA 2nd Renourshment END-GSA 3rd Renourshment END-GSA 4rd Renourshment END-GSA 4th Renourshment END-GSA	0 4 8 12 15	ntage of Contract 10% 20% 20%	1	-\$22,891,871	\$6,765,998	\$6,765,996	\$6,766,998	\$6,785.998 51,353,200	\$6,765,998	\$682,921 \$6,795,998	\$682.521 \$6,765,998	58,487,134	\$6,487,134	58 497,134	\$8,467,134	\$629,568 \$4,826,698
EAD+S&A 1st Renounshment E&D+S&A 2nd Remourishment EAD+S&A 3rd Renourishment EAD+S&A 4th Renourishment EAD+S&A 5th Penounishment EAD+S&A 5th Penounishment	0 4 8 12	ntage of Contract 10% 20% 20% 20%	1 1 1 1 1 1 1 1	-\$22,891,871	\$6,765,998	\$6,765,996	\$6,766,998	\$6.785.99 8	\$6,765,998	\$685,921 \$6,765,998	\$682.521 \$6,765,998	53,487,134	\$6,487,134	58 497,124	\$6,467,134	\$638,568 \$4,826,688
EAD-SEA 14 Renounthment EAD-SEA 2nd Renounthment EAD-SEA 3nd Renounthment EAD-SEA 4th Renounthment EAD-SEA 4th Renounthment EAD-SEA 5th Penounthment EAD-SEA	0 4 8 12 16 20	ntage of Contract 10% 20% 20% 20%	1 1 1	-\$22,891,871	\$6,765,998	\$6,765,996	\$6,766,998	\$6.785.99 8	\$6,765,968	\$682,921 \$6,765,998	\$682.521 \$6,765,998	53,487,134	\$6,487,134	58 497,124	\$8,467,134	\$628,568 \$4,826,688
EAD-SAA 14 Renounthrenant EAD-SAA 2nd Renounthrenant EAD-SAA 3rd Renounthrenant EAD-SAA 4th Renounthrenant EAD-SAA 5th Personanthrenant EAD-SAA 5th Personanthrenant EAD-SAA 6th Renounthrenant EAD-SAA	0 4 8 10 16 20 24	ntage of Contract 10% 20% 20% 20%	1 1 1 1 1 1 1 1	-\$22,891,871	\$6,765,998	\$6,765,996	\$6,766,998	\$6.785.99 8	\$6,765,998	\$682,521 \$6,765,996	\$682.521 \$6,765,998	50,487,134	\$1,907,017 \$8,487,134	59 497 124	\$6,467,134	\$626,606 \$4,826,606
EAD-SSA 14 Renountment EAD-SSA 2nd Renountment EAD-SSA 3id Renountment EAD-SSA 4th Renountment EAD-SSA 4th Renountment EAD-SSA 5th Renountment EAD-SSA 5th Renountment EAD-SSA 5th Renountment EAD-SSA 5th Renountment EAD-SSA 7th Renountment	0 4 8 12 16 20	ntage of Contract 10% 20% 20% 20% 20% 20% 20%	1 1 1 1 1 1 1 1	-\$22,891,871	\$6,765,998	\$6,765,996	\$6,766,998	\$6.785.99 8	\$6,765,998	\$6,785,998	\$6,765,996	50,487,134	\$6,467,134	59 497 134	\$8,467,134	\$626,686 \$4,626,686
EAD-SSA 14 Renountment EAD-SSA 2nd Renountment EAD-SSA 3id Renountment EAD-SSA 4th Renountment EAD-SSA 4th Renountment EAD-SSA 5th Renountment	0 4 8 10 16 20 24	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	1 1 1 1 1 1 1 1	-\$22,891,871	\$6,765,998	\$6,765,996	\$6,766,998	\$6.785.99 8	\$6,765,998	\$6,785,998	\$682.521 \$6,765,998	\$8,487,134	\$6,467,134	59 497 134	\$8,467,134	\$628,568 \$4,826,686
EAD-SSA 1st Renountment EAD+SSA 2nd Renountment EAD+SSA 3nd Renountment EAD+SSA 3nd Renountment EAD+SSA 4th Renountment EAD+SSA 5th Renountment EAD+SSA	0 4 8 10 15 20 24 26 30	ntage of Contract 10% 20% 20% 20% 20% 20% 20%	1 1 1 1 1 1 1 1	-\$22,891,871	\$6,765,998	\$6,765,996	\$6,766,998	\$6.785.99 8	\$6,765,998	\$6,785,998	\$6,765,996	\$0,487,134 \$1,687,427	\$1,107,017 \$6,467,134	59 497 134	\$8,467,134	\$628,568 \$4,826,686
EAD-SSA 14 Renountment EAD-SSA 2nd Renountment EAD-SSA 2nd Renountment EAD-SSA 3rd Renountment EAD-SSA 4th Renountment EAD-SSA 5th Renountment	0 4 a 10 15 20 24 28	ntage of Contract 10% 20% 20% 20% 20% 20% 20%	1 1 1 1 1 1 1 1 1 1 1	-\$22,891,871	\$6,765,998	\$6,765,996	\$6,766,998	\$6.785.99 8	\$6,765,998	\$6,785,998	\$6,765,996	\$8,487,134	\$6,487,13 ⁴	31-107-77 39-147-134	\$8,467,134	\$678,566 \$4.626,686
EAD-SSA 14 Renountment EAD SSA 2nd Renountment EAD-SSA 3nd Renountment EAD-SSA 3nd Renountment EAD-SSA 4th Renountment EAD-SSA 5th Renountment	0 4 8 10 15 20 24 26 30	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20%	1 1 1 1 1 1 1 1 1 1 1 1	-\$22,891,871	\$6,765,998	\$6,765,996	\$6,766,998	\$6.785.99 8	\$6,765,998	\$6,785,998	\$6,765,996	\$8,487,134	\$1,697,427	59 497,134	36,467,1134	\$678,568 \$4,826,686
EAD-SSA 141 Ranoumbinnent EAD-SSA 2nd Remouls himment EAD-SSA 3nd Renouls himment EAD-SSA 4th Renouls himment EAD-SSA 5th Renouls himment EAD-SSA 10th Renouls himment EAD-SSA 10th Renouls himment EAD-SSA	0 4 8 10 15 20 24 26 33 36 40	ntage of Contract 10% 20% 20% 20% 20% 20% 20%	1 1 1 1 1 1 1 1 1 1 1	-\$22,891,871	\$6,765,998	\$6,765,996	\$6,766,998	\$6.785.99 8	\$6,765,998	\$6,785,998	\$6,765,996	\$8,487,134	\$6,487,13 ⁴	\$9.497.124 \$9.497.427	\$6,467,134	\$678,966 \$4,626,666
EAD-SSA 1at Renountment EAD-SSA 2nd Renountment EAD-SSA 2nd Renountment EAD-SSA 3nd Renountment EAD-SSA 4th Renountment EAD-SSA 5th Renountment EAD-SSA 5th Renountment EAD-SSA 5th Renountment EAD-SSA 5th Renountment EAD-SSA 6th Renountment EAD-SSA 10th Renountment EAD-SSA	0 4 8 12 15 20 24 26 32 36	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20%	1 1 1 1 1 1 1 1 1 1 1 1	-\$22,891,871	\$6,765,998	\$6,765,996	\$6,766,998	\$6.785.99 8	\$6,765,998	\$6,785,998	\$6,765,996	\$8,487,134	\$6,487,13 ⁴	59 497,134	36,467,134	\$678,696 \$4.626,696
EAD-SSA 14 Renountment EAD-SSA 2nd Renountment EAD-SSA 3nd Renountment EAD-SSA 3nd Renountment EAD-SSA 4th Renountment EAD-SSA 5th Renountment EAD-SSA 10th Renountment EAD-SSA 11th Renountment EAD-SSA 11th Renountment EAD-SSA 11th Renountment EAD-SSA 12th Renountment	0 4 8 10 15 20 24 26 33 36 40	niage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	-\$22,891,871	\$6,765,998	\$6,765,996	\$6,766,998	\$6.785.99 8	\$6,765,998	\$6,785,998	\$6,765,996	\$8,487,134	\$6,487,13 ⁴	59 497,134	\$6,467,134 \$1,667,427	\$4,625,006
EAD-SSA 141 Renountment EAD-SSA 2nd Renountment EAD-SSA 3nd Renountment EAD-SSA 3nd Renountment EAD-SSA 4th Renountment EAD-SSA 5th Renountment EAD-SSA 10th Renountment EAD-SSA 10th Renountment EAD-SSA 11th Renountment EAD-SSA 11th Renountment	0 4 8 15 16 20 24 26 32 35 40	10% 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	-\$22,891,871	\$6,765,998	\$6,765,996	\$6,766,998	\$6.785.99 8	\$6,765,998	\$6,785,998	\$6,765,996	\$8,487,134	\$6,487,13 ⁴	59 497,134	36,467,134	\$572,666 \$4,826,606
EAD-SSA 14 Renountment EAD-SSA 2nd Renountment EAD-SSA 3nd Renountment EAD-SSA 3nd Renountment EAD-SSA 4th Renountment EAD-SSA 5th Renountment EAD-SSA 10th Renountment EAD-SSA 11th Renountment EAD-SSA 11th Renountment EAD-SSA 11th Renountment EAD-SSA 12th Renountment	0 4 8 15 16 20 24 26 32 35 40	niage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	-\$22,891,871 \$2,289.187	\$6,765,098 \$1,353,200	\$6,765,996	\$6,795,995 \$1,353,200	50,785,993	\$6,765,668	\$6,795,998 \$1,353,200	\$6,765,996	\$1,697,427	\$1,697,427	\$1.697.427	\$6,467,134 \$1,607,427	\$4,625,006
EAD-SSA 14 Renountment EAD-SSA 2nd Renountment EAD-SSA 2nd Renountment EAD-SSA 2nd Renountment EAD-SSA 3nd Renountment EAD-SSA 3nd Renountment EAD-SSA 4th Renountment EAD-SSA 5th Renountment EAD-SSA 8th Renountment EAD-SSA 8th Renountmentment EAD-SSA 8th Renountmentment EAD-SSA 8th Renountmentment EAD-SSA 8th Renountmentment EAD-SSA 10th Renountmentment EAD-SSA 10th Renountmentment EAD-SSA 10th Renountmentment EAD-SSA 10th Renountmentment EAD-SSA 10th Renountmentment EAD-SSA 12th Renountmentment EAD-SSA 12th Renountmentment EAD-SSA 12th Renountmentment EAD-SSA	0 4 8 15 16 20 24 26 32 35 40	niage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	-\$22,891,871 \$2,289.187	\$6,765,098 \$1,353,200	\$6,765,996	\$1,353,200	\$6,785,998 \$1,353,200	\$6,765,668	\$6,795,998 \$1,353,200	\$6,765,996	\$8,487,134	\$1,697,427	\$1.697.427	\$6,467,134 \$1,607,427	\$4,625,006 \$905,338
EAD-SSA 14 Renountment EAD-SSA 2nd Renountment EAD-SSA 2nd Renountment EAD-SSA 2nd Renountment EAD-SSA 3nd Renountment EAD-SSA 3nd Renountment EAD-SSA 4th Renountment EAD-SSA 5th Renountment EAD-SSA 8th Renountment EAD-SSA 8th Renountmentment EAD-SSA 8th Renountmentment EAD-SSA 8th Renountmentment EAD-SSA 8th Renountmentment EAD-SSA 10th Renountmentment EAD-SSA 10th Renountmentment EAD-SSA 10th Renountmentment EAD-SSA 10th Renountmentment EAD-SSA 10th Renountmentment EAD-SSA 12th Renountmentment EAD-SSA 12th Renountmentment EAD-SSA 12th Renountmentment EAD-SSA	0 4 8 15 16 20 24 26 32 35 40	niage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	-\$22,891,871 \$2,289.187	\$6,765,098 \$1,353,200	\$6,765,996	\$6,795,995 \$1,353,200	\$6,785,998 \$1,353,200	\$6,765,668	\$6,795,998 \$1,353,200	\$6,765,996	\$1,697,427	\$1,697,427	\$1.697.427	\$6,467,134 \$1,607,427	\$4,625,006 \$905,338
EAD-SSA 14 Renountment EAD-SSA 2nd Renountment EAD-SSA 2nd Renountment EAD-SSA 3nd Renountment EAD-SSA 3nd Renountment EAD-SSA 4th Renountment EAD-SSA 4th Renountment EAD-SSA 5th Renountment EAD-SSA 10th Renountment	0 4 8 15 16 20 24 26 32 35 40	niage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	-\$22,891,871 \$2,289.187	\$6,765,098 \$1,353,200	\$6,765,996	\$6,195,995 \$1,353,200 \$5,119,197	50,785,998 51,353,200 53,119,197 d Annual Costs	\$6,765,668 \$1,363,200 \$1,363,200	\$6,795,998 \$1,353,200 \$1,353,200	\$6,785,996 \$1,363,200 \$1,363,200	\$1,697,427	\$1,697,427	\$1.697.427	\$6,467,134 \$1,607,427	\$4,625,006 \$905,338
EAD-SSA 14 Renountment EAD-SSA 2nd Renountment EAD-SSA 2nd Renountment EAD-SSA 3nd Renountment EAD-SSA 3nd Renountment EAD-SSA 4th Renountment EAD-SSA 6th Renountment EAD-SSA 6th Renountment EAD-SSA 8th Renountment EAD-SSA 8th Renountment EAD-SSA 10th Renountmentment EAD-SSA 10th Renountmentment EAD-SSA 10th Renountmentment EAD-SSA 10th Renountmentmentmentmentmentmentmentmentmentme	0 4 8 15 16 20 24 26 32 35 40	niage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	\$22,891,871 \$2,289,187 \$2,289,187	\$6,765,998 \$1,353,200 \$5,114,167	\$6,765,996 \$1,353,200 \$1,353,200 \$5,110,107 Sturmman	\$5,795,995 \$1,353,200 \$5,116,197 9-investment an	\$6,785,993 \$1,353,200 \$3,119,197 4 Annual Costs	\$6,765,668 \$1,363,203 \$1,363,203 \$9,119,167	\$6,795,898 \$1,953,200 \$1,953,200 \$4,710,197	\$6,785,996 \$1,263,200 \$1,263,200	\$1,897,427 \$1,897,427	\$1,697,127 \$1,697,127 \$10,184.680	\$1.697.427 \$1.697.427	\$6,467,134 \$1,607,427 \$10,184 500	\$4,825,686 \$965,338 \$5,762,025
EAD-SSA 1st Renountment EAD-SSA 2nd Renountment EAD-SSA 2nd Renountment EAD-SSA 3nd Renountment EAD-SSA 3nd Renountment EAD-SSA 4th Renountment EAD-SSA 4th Renountment EAD-SSA 5th Renountment EAD-SSA 1th Renountment EAD-SSA 1th Renountment EAD-SSA 1th Renountment EAD-SSA 1th Renountment 1th Renountment 1th Renountment EAD-SSA 1th Renountment EAD-SSA 1th Renountment EAD-SSA 1th Renountment EAD-SSA 1th Renountment EAD-SSA 1th Renountment EAD-SSA 1th Renountment EAD-SSA 1th Renountment EAD-SSA 1th Renountment EAD-SSA 1th Renountment EAD-SSA 1th Renountment EAD-SSA 1th Renountment EAD-SSA 1th Renountment EAD-SSA	0 4 8 15 16 20 24 26 32 35 40	niage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	\$22,891,871 \$2,289.187 \$2,289.187 \$25,181,058	\$6,765,096 \$1,353,200 \$2,110,167	\$6,765,996 \$1.353,200 \$1.353,200 \$58,110,107 \$58,7757	\$6,195,995 \$1,353,200 \$1,353,200 \$56,119,197	50,785,998 51,353,200 53,119,197 d Annual Costs 58,119,197	\$1,553,203 \$1,553,203 \$9,119,167 Renoun- 20 \$3,119,167	\$6,795,998 \$1,353,200 \$1,353,200 \$8,110,197 usbrmant at Indica	\$1,363,200 \$1,363,200 \$8,119,197	\$1,697,427 \$1,697,427 \$10,164,560	\$0,497,134 \$1,697,427 \$10,183,580 25 \$10,184,580	\$1,697,427 \$1,097,427 \$10,184,560	\$6,457,134 \$1,697,427 \$10,134,560	\$4,826,686 \$995,338 \$5,792,025
EAD-SSA 1st Renountment EAD-SSA 2nd Renountment EAD-SSA 2nd Renountment EAD-SSA 3nd Renountment EAD-SSA 3nd Renountment EAD-SSA 4th Renountment EAD-SSA 4th Renountment EAD-SSA 5th Renountment 6AD-SSA 10th	0 4 8 15 16 20 24 26 32 35 40	niage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	\$22,891,871 \$2,289.187 \$2,289.187 \$25,181,059 \$130,111	\$8,765,998 \$1,353,200 \$1,353,200 \$3,110,107 \$0,110,107	\$6,765,996 \$1,353,200 \$1,353,200 \$5,116,197 Surremar \$5,119,197 \$0	\$6,795,995 \$1,353,200 \$1,353,200 \$1,353,200 \$1,353,200 \$1,353,200 \$1,353,200	\$0,785,993 \$1,353,200 \$1,353,200 \$2 Annual Costs \$6,109,197 \$0	\$1,553,200 \$1,553,200 \$1,553,200 \$9,119,167 Reneur 20 54,118,167 50	\$6,795,998 \$1,953,200 \$1,953,200 \$8,110,197 usbreard at Indicate 24 \$2,110,197 \$0	\$6,785,996 \$1,363,200 \$1,363,200 \$1,119,197 lod Year 25 \$1,119,197 \$3,119,197	\$1,697,427 \$1,697,427 \$10,164,560 \$0	\$1,597,427 \$10,184,580 \$50,184,590 \$0	\$1,697,427 \$10,164,560 \$10,164,560 \$0	\$1,897,427 \$10,134,590 \$10,144,590 \$0	\$4,826,686 \$905,338 \$5,792,025 \$5,792,025
EAD-SSA 1st Renounshment EAD-SSA Ind Renounshment EAD-SSA Ind Renounshment EAD-SSA Ind Renounshment EAD-SSA Ind Renounshment EAD-SSA Sth Renounshment EAD-SSA Sth Renounshment EAD-SSA Sth Renounshment EAD-SSA Sth Renounshment EAD-SSA Sth Renounshment EAD-SSA Oth Renounshment EAD-SSA Oth Renounshment EAD-SSA Ind Renounshment EAD-SSA	0 4 8 15 16 20 24 26 32 35 40	niage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	\$22,891,871 \$2,289.187 \$2,289.187 \$25,181,058	\$8,765,098 \$1,353,200 \$1,353,200 \$5,110,107 \$6,110,107 \$3,110,107	\$6,765,996 \$1.353,200 \$1.353,200 \$58,110,107 \$58,7757	\$6,195,995 \$1,353,200 \$1,353,200 \$56,119,197	50,785,998 51,353,200 53,119,197 d Annual Costs 58,119,197	\$1,553,203 \$1,553,203 \$9,119,167 Renoun- 20 \$3,119,167	\$6,795,998 \$1,353,200 \$1,353,200 \$8,110,197 usbrmant at Indica	\$1,363,200 \$1,363,200 \$8,119,197	\$1,697,427 \$1,697,427 \$10,164,560 \$0	\$1,697,127 \$1,697,127 \$10,183,580 25 \$10,184,580 \$10,184,580	\$1,697,427 \$10,164,560 \$10,164,560 \$0	\$6,457,134 \$1,697,427 \$10,134,560	\$4,826,686 \$995,338 \$5,792,025

Average Annual Cost	\$3,522,696
Interest Rate	6 125%

Estimate of Contract and Construction Costs Pompa to Beach Lauderdale-by-the-Sea 75' Added Shoreline Width (II) 5 Year Renounshimet Interval Project Life 50 yrs

Item	Project Year	Unit Cost	Quantity	o.	5	10	15	Rencurishment a 20	at Indicated Year 25	30	35	40	45
lourishment.	0	** and ***				•					<u>-</u>		
Mobilization/Demobilization Beach Fill		\$1,000,000 \$5.50	2,792,708	\$1,000,000 \$18,152,599									
Beach Tilling (ac)		\$300	69.0	\$20,714									
Hard Bottom Mitigation (ac)		\$300,000	67	\$2,010,000									
st Renourishment	5												
Mobilization/Demobilization		\$1,000,000	1		\$1,000,000								
Beach Fill		\$6.50	935,400		\$6,080,100								
Beach Tilling (ac) Hard Bottom Mitigation (ac)		\$300	69.0		\$20,714 \$0								
and Bottom Witigation (ac)	10				3 0								
Mobilization/Demobilization	••	\$1,000,000	1			\$1,000,000							
Beach Fill		\$6.50	935,400			\$6,080,100							
Beach Tilling (ac)		\$300	69 0			\$20,714							
Hard Bottom Mitigation (ac) ird Renourishment	15					\$0							
Mobilization/Demobilization	15	\$1,000,000	1				\$1,000,000						
Beach Fill		\$6.50	935,400				\$6,080,100						
Beach Tilling (ac)		\$300	69 O				\$20,714						
Hard Bottom Mitigation (ac)							\$0						
th Renourishment	20												
Mebilization/Demobilization Beach Fill		\$1,000,000	1 005 400					\$1,000,000 \$6,080,100					
Beach Tilling (ac)		\$6.50 \$300	935,400 69,0					\$20,714					
Hard Boltom Mitigation (ac)		\$300	00.0					\$0					
ith Renounshment	25							30					
Mobilization/Demobilization		\$1,000,000	1						\$1,000,000				
Beach Fill		\$6,50	935,400						\$6,080,100				
Beach Tilling (ac)		\$300	89.0						\$20,714				
Hard Boltom Mitigation (ac) Sth Renourishment	30								\$0				
on Kenourishment Mobilization/Demobilization	aU	\$1,000,000	1							\$1,000,000			
Beach Fill		\$8.50	935,400							\$7,950,900			
Beach Tilling (ac)		\$300	89.0							\$20,714			
Hard Bottom Mitigation (ac)										\$0			
Th Renourishment	<i>క</i> న్	** ***	_								h. 000 000		
Mobilization/Demobilization		\$1,000,000	1 25 100								\$1,000,000		
Beach Fill Beach Tilling (ac)		\$8.50 \$300	935,400 69.0								\$7,950,900 \$20,714		
Hard Bottom Mitigation (ac)		4500	05.0								\$0		
th Renourishment	40										**		
Mobilization/Demobilization		\$1,000,000	1									\$1,000,000	
Beach Fill		\$8.50	935,400									\$7,950,900	
Beach Tilling (ac)		\$300	69.0									\$20,714	
Hard Boltom Mitigation (ac) Sth Renourishment	45											\$ D	
Mobilization/Demobilization	45	\$1,000,000	1										\$1,000,00
Beach Fill		\$8.50	935,400										\$7,950,90
Beach Tilling (ac)		\$300	69.0										\$20,714
Hard Boltom Mitigation (ac)													\$0
Subtotal				\$21,183,313	\$7,190,814	\$7,100,814	\$7,100,814	\$7,100,814	\$7,100,814	\$8,971,614	\$8,971,614	\$8,971,614	\$8,971,61
Contingency		15%		\$3,177,497	\$1,065,122	\$1,065,122	\$1,065.122	\$1,065,122	\$1.065,122	\$1,345,742	\$1,345,742	\$1,345,742	\$1,345,74
Subtotal Contract Cost		1070		\$24,360,810	\$8,165,937	\$8,165,937	\$8,165.937	\$8,165,937	\$8,165,937	\$10,317,357	\$10,317,357	\$10,317,357	\$10,317,35
		intage of Contract	Costs										
Nourishment FAD on /	D	400	_	* 0.100.004									
E&D+S&/ 1st Renourishment	5	10%	1	\$2,435,081									
E&D+S&A	J	20%	1		\$1,633,187								
2nd Renourishment	4.5		•		21/200/101								
E&D+S&A	70												
	10	20%	1			\$1,633,187							
3rd Renourishment	15					\$1,633,187							
3rd Renourishment E&D+S&A	15	20% 20%	1			\$1,633,187	\$1,633,187						
3rd Renourishment E&D+S&A 4th Renourishment		20%	1			\$1,633,187	\$1,633,187	64.664.45					
3rd Renourishment E&D+S&A Nh Renourishment E&D+S&A	15 20					\$1,633,187	\$1,633,187	\$1,633,187					
Brd Renourishment E8D+S8A Atth Renourishment E8D+S8A Sth Renourishment	15	20% 20%	1			\$1,633,187	\$1,633,187	\$1,633,187	S1 833 147				
Brd Renourishment E&D+S&A Ith Renourishment E&O+S&A Sin Renourishment E&O+S&A	15 20	20%	1			\$1,633,187	\$1,633,187	\$ 1,633,187	\$1,633,167				
Bitd Renourishment E&D+S&A Ith Renounshment E&D+S&A Sith Renounshment E&O+S&A Sith Renounshment E&O+S&A Sith Renounshment E&O+S&A	15 20 25 30	20% 20%	1			\$1,633,187	\$1,633,187	\$1,633,187	\$1,833,167	\$2,063,471			
Brd Renourishment E&D+S&A Alth Renourishment E&O+S&A Sih Renourishment E&O+S&A Sih Renourishment E&O+S&A Alth Renourishment E&D+S&A Alth Renourishment	15 20 25	20% 20% 20% 20%	1 1 1			\$1,633,187	\$1,633,187	\$1,633,187	\$1,833,167	\$2,063,471			
did Renourishment E&D+S&A tih Renourishment E&O+S&A Sih Renourishment E&O+S&A Sih Renourishment E&O+S&A A Tih Renourishment E&D+S&A Tih Renourishment E&D+S&A	15 20 25 30 35	20% 20% 20%	1 1 1			\$1,633,181	\$1,633,187	\$1,633,187	\$1,833,167	\$2,063,471	\$2,063,471		
8rd Renourishment E&D+S&A 4th Renourishment E&O+S&A 5th Renourishment E&O+S&A 6th Renourishment E&O+S&A 7th Renourishment E&O+S&A 8th Renourishment E&O+S&A 8th Renourishment	15 20 25 30	20% 20% 20% 20% 20%	1 1 1 1			\$1,633,187	\$1,633,187	\$1,633,187	\$1,833,167	\$2,063,471	\$2,083,471	83.000.47 (
aird Renourishment E&D+S&A 4th Renounshment E&D+S&A 5th Renounshment E&O+S&A 5th Renounshment E&D+S&A 7th Renourishment E&D+S&A 8th Renourishment E&D+S&A 8th Renourishment E&D+S&A	15 20 25 30 35 40	20% 20% 20% 20%	1 1 1			\$1,633,187	\$1,633,187	\$1,633,187	\$1,633,167	\$2,083,471	\$2,083,471	\$2,063,471	
aid Renourishment E&D+S&A Ith Renounshment E&D+S&A Sih Renounshment E&D+S&A Sih Renounshment E&D+S&A Sih Renounshment E&D+S&A Sih Renourishment E&D+S&A Sih Renourishment E&D+S&A Sih Renourishment E&D+S&A	15 20 25 30 35	20% 20% 20% 20% 20% 20%	1 1 1 1 1			\$1,633,187	\$1,633,187	\$1,633,187	\$1,833,167	\$2,063,471	\$2.083,471	\$2,063,471	52 083 47
rd Renourishment E&D+S&A th Renourishment E&O+S&A	15 20 25 30 35 40	20% 20% 20% 20% 20%	1 1 1 1			\$1,633,187	\$1,633.187	\$1,633,187	\$1,633,167	\$2,663,471	\$2,083,471	\$2,063,471	\$2,083,47
rd Renourishment E&D+S&A th Renourishment E&O+S&A th Renourishment E&O+S&A th Renourishment E&D+S&A th Renourishment	15 20 25 30 35 40	20% 20% 20% 20% 20% 20%	1 1 1 1 1	\$26,793,801	\$9,799,124	\$1,633,181 \$9,769,124	\$1,633.187 \$9,795,124					\$2,083,471 \$12,380,828	\$2,083,47 \$12,380,8
rid Renourishment E&D+S&A Ith Renourishment E&D+S&A Sih Renourishment E&O+S&A Sift Renourishment E&D+S&A Th Renourishment E&D+S&A Sift Renourishment E&D+S&A Sift Renourishment E&D+S&A Sift Renourishment E&D+S&A Sift Renourishment E&D+S&A	15 20 25 30 35 40	20% 20% 20% 20% 20% 20%	1 1 1 1 1			\$9,769,124	\$9.799,124						
did Renourishment E&D+S&A th Renourishment E&D+S&A Sih Renourishment E&O+S&A Sih Renourishment E&D+S&A fih Renourishment E&D+S&A dith Renourishment E&D+S&A dith Renourishment E&D+S&A dith Renourishment E&D+S&A dith Renourishment E&D+S&A	15 20 25 30 35 40	20% 20% 20% 20% 20% 20%	1 1 1 1 1				\$9.799,124	\$9,799,024	\$9,769,124	\$12,380,828			
tird Renourishment E&D+S&A Ith Renourishment E&O+S&A Sith Renourishment E&O+S&A Sith Renourishment E&D+S&A A Th Renourishment E&D+S&A Sith Renourishment E&D+S&A Sith Renourishment E&D+S&A Sith Renourishment E&D+S&A Sith Renourishment E&D+S&A	15 20 25 30 35 40	20% 20% 20% 20% 20% 20%	1 1 1 1 1	s	iummary-investr	\$9,769,124 ment and Annua	\$9.795,124 Il Casta	\$9,799,124 Renounstment	\$5,759,124 at indicated Year	\$12,380,828	\$12,360,525	\$12,380,828	\$12,380,8
rid Renourishment E&D+S&A Ith Renourishment E&O+S&A Sth Renourishment E&O+S&A Sth Renourishment E&D+S&A rith Renourishment E&D+S&A Arth Renourishment E&D+S&A Arth Renourishment E&D+S&A Arth Renourishment E&D+S&A Total Construction Cost	15 20 25 30 35 40	20% 20% 20% 20% 20% 20%	1 1 1 1 1	s · c	Summary-Investr	\$9,769,124 ment and Annua 10	\$9.795,124 il Costa 15	\$9,799,124 Renoursement	\$9,799,124 at indicated Year 25	\$12,380,828	\$12,39G,525 35	\$12,380,828 40	\$12,380,8
and Renourishment E&D+S&A tth Renounshment E&O+S&A Sth Renounshment E&O+S&A Sth Renounshment E&O+S&A Sth Renounshment E&O+S&A And Renounshment E&O+S&A Sth Renounshment E&O+S&A Sth Renounshment E&D+S&A Total Construction Cost	15 20 25 30 35 40	20% 20% 20% 20% 20% 20%	1 1 1 1 1	6 \$25,796,891	5 5 58,799,124	\$9,769,124 ment and Annue 10 \$9,759,124	\$9.795,124 il Costs 15 \$9.705,124	\$9,799.124 Renourisement 20 \$9,799.124	\$9,759,124 at indicated Year 25 \$9,759,124	\$12,380,828	\$12,380,828 35 \$12,380,828	\$12,380,828 40	\$12,380,8 45 \$12,380,8
Ird Renourishment E&D+S&A Ith Renourishment E&D+S&A Sth Renourishment E&D+S&A Sth Renourishment E&D+S&A Sth Renourishment E&D+S&A Th Renourishment E&D+S&A Sth Renourishment E&D+S&A Total Construction Cost Item Construction Cost Item Construction Cost	15 20 25 30 35 40	20% 20% 20% 20% 20% 20%	1 1 1 1 1	6 \$25,796,891 \$139,146	5 \$8,799,124 \$0	\$9,769,124 ment and Annua 10 \$9,799,124 \$9	\$9,795,124 Il Costa 15 59,796,124	\$9,799,124 Kenourianmeni 20 \$0,769,124 \$0	\$9,799,124 at indicated Year 25 \$9,799,124 \$0	\$12,380,828 30 \$12,380,828 \$3	\$12.360,829 35 \$12.360,828 \$0	\$12,380,828 40 \$12,380,828 \$0	\$12,380,8 45 \$12,380,8 \$0
rd Renourishment E80+S8A th Renourishment E80+S8A th Renourishment E80+S8A th Renourishment E80+S8A th Renourishment E80+S8A th Renourishment E80+S8A th Renourishment E80+S8A th Renourishment E80+S8A Total Construction Cost	15 20 25 30 35 40	20% 20% 20% 20% 20% 20%	1 1 1 1 1	6 \$25,796,891	5 5 58,799,124	\$9,769,124 ment and Annue 10 \$9,759,124	\$9.795,124 il Costs 15 \$9.705,124	\$9,799,124 Kenourianmeni 20 \$0,769,124 \$0	\$9,799,124 at indicated Year 25 \$9,799,124 \$0	\$12,380,828	\$12,380,828 35 \$12,380,828	\$12,380,828 40 \$12,380,828 \$0	\$12,380,8 45 \$12,380,8 \$0 \$12,380,8
rd Repourishment E80+S8A th Renourishment E80+S8A Total Construction Cost Item construction Cost	15 20 25 30 35 40	20% 20% 20% 20% 20% 20%	1 1 1 1 1	6 \$25,796,891 \$139,146	5 \$8,799,124 \$0	\$9,769,124 ment and Annua 10 \$9,799,124 \$9	\$9,795,124 Il Costa 15 59,796,124	\$9,799,124 Renoursement 20 \$9,799,124 \$0 \$9,799,124	\$9,799,124 at indicated Year 25 \$9,799,124 \$0	\$12,380,828 30 \$12,380,828 \$3	\$12.360,829 35 \$12.360,828 \$0	\$12,380,828 40 \$12,380,828 \$0	\$12,380,8 45 \$12,380,8 . \$0
Id Repourishment E&D+S&A th Renounshment E&D+S&A Total Construction Cost Item ionstruction Cost Idem	15 20 25 30 35 40	20% 20% 20% 20% 20% 20%	1 1 1 1 1	6 \$26,796,891 \$139,146 \$25,936,639	5 \$6,799,124 \$0 \$9,799,124	\$9,769,124 ment and Annua 10 \$9,769,124 \$9 \$8,760,124	18 59.795,124 16 Costs 18 59.705,124 50 59,705,124	\$9,799,124 Kanourianment, 20 \$0,799,124 \$0 \$8,799,124 \$2,884,236	\$9,799,124 at indicated Year 25 \$9,799,124 \$0 \$9,799,124	\$12,389,828 30 \$12,380,828 \$0 \$12,380,828	\$12,360,829 35 \$12,360,828 \$0 \$12,380,828	\$12,380,828 40 \$12,380,828 \$0 \$12,380,828	\$12,380, 45 \$12,380, \$0

Average Annua (0x4) Interest Rate 50,518**,2**64 5,425%

Estimate of Contract and Construction Costs Pompano Bacchi, auderdale by-the-Seo 75' Added Shoreline Width (h) 6 Year Renourishment Interval Project Life: 50 yrs

llem	Project Year	Unit Cost	Quantity	0	6	12	Renouri 18	ishment at Indica 24	ated Year 30	36	42	48
Nourishment	0				. •	IZ	10	24	JU	30	42	40
Mobilization/Demobilization		\$1,000,000	1	\$1,000,000								
Beach Fill		\$6.50	2,979,788	\$19,368,619								
Beach Tilling (ac)		\$300	73.4	\$22,033								
Hard Bottom Mitigation (ac)	_	\$300,000	7.0	\$2,100,000								
1st Renourishment	6											
Mobilization/Demobilization		\$1,000,000	1		\$1,000,000							
Beach Fill		\$6.50	1,122,480		\$7,296,120							
Beach Tilling (ac)		\$300	73.4		\$22,033							
Hard Bottom Mitigation (ac) 2nd Renourishment	12				\$0							
Mobilization/Demobilization	12	\$1,000,000	1			\$1,000,000						
Beach Fill		\$6.50	1,122,480			\$7,296,120						
Beach Tilling (ac)		\$300	73.4			\$22,033						
Hard Bottom Mitigation (ac)		4	,			\$0						
3rd Renourishment	16											
Mobilization/Demobilization		\$1,000,000	1				\$1,000,000					
Beach Fill		\$6.50	1,122,480				\$7,296,120					
Beach Tilling (ac)		\$30D	73.4	ł			\$22,033					
 Hard Bottom Mitigation (ac) 				·			\$0					
th Renourishment	24			ł								
Mobilization/Demobilization		o1,000,000	1					\$1,000,000				
Beach Fill		\$6.50	1,122,480					\$7,296,120				
Beach Tilling (ac)		\$300	73.4					\$22,033				
Hard Bottom Mitigation (ac)	**							\$0				
5th Renourishment	30	£1 000 000							£4 000 000			
Mobilization/Demobilization Beach Fill		\$1,000,000 \$8.50	1 122 480						\$1,000,000			
Beach Tilling (ac)		\$8.50	1,122,480 73,4						\$9,541,080 \$22,033			
Hard Bottom Mitigation (ac)		2460	10.4						\$22,033 \$0			
Oth Renourishment	36								4U			
Mobilization/Demobilization	05	\$1,000,000	1							\$1,000,000		
Beach Fill		\$8.50	1,122,480							\$9,541,080		
Beach Tilling (ac)		2300	73.4							\$22,033		
Hard Bottom Mitigation (ac)		•								SO		
th Renourishment	42											
Mobilization/Demobilization		\$1,000,000	1								\$1,000,000	
Beach Fill		\$8.50	1,122,480								\$9,541,080	
Beach Tilling (ac)		\$300	73.4								\$22,033	
Hard Bottom Mitigation (ac)											\$0	
8th Renourishment	48	_										
Mobilization/Demobilization		\$1,000,000	1	1								\$1,000,000
Beach Fill		\$8.50	374,160	1								\$3,180,360
Beach Tilling (ac) Hard Bottom Mitigation (ac)		\$300	55.9	1								\$16,760
nate potion langation (ac)				•								\$0
Subtotal	-			\$22,490,651	\$8,318,153	\$8,318,153	\$8,318,153	\$8,318,153	\$10,563,113	\$10,563,113	\$10,563,113	\$4,197,120
Contingency		15%		\$3,373,598	\$1,247,723	\$1,247,723	\$1,247,723	\$1,247,723	\$1,584,467	\$1,584,467	\$1,584,467	\$629.568
Subtotal Contract Cost				\$25,864,249	\$9,565,875	\$9,565,875	\$9,565,875	\$9,565,875	\$12,147,579	\$12,147,579	\$12,147,579	\$4,826,688
		ntage of Contract	Costs									
Nourishment	Ð			}								
E&D+S&A		10%	1	\$2,586,425								
1st Renourishment	6	06**		1								
E&D+S&A	40	20%	1		\$1,913,175							
2nd Renourishment E&D+S&A	12	2001				64.040.490						
E&D+S&A 3rd Renourishment	40	20%	1	i		\$1,913,175						
SIG Renourishment E&D+S&A	18	20%	1	1			C1 013 17F					
4th Renourishment	24	20%		1			\$1,913,175					
E&D+S&A	24	20%	1	!				\$1,913,175				
5th Renourishment	30	2070	'	l				31,813,173				
. E&D+S&A		20%	1						\$2,429,516			
6th Renourishment	36		•						40			
E&D+S&A	=	20%	1							\$2,429,516		
7th Renourishment	42		•							721.201010		
E&D+S&A	-	20%	1								\$2,429,516	
8th Renourishment	48											
E&D+S&A		20%	1									\$965,338
Total Construction Cost				\$28,450,674	\$11,479,051	\$11,479.051	\$11,479,051	\$11,479,061	\$14,577,095	\$14,577,095	\$14,577,095	\$5,792,025
												
				Summar	y-Investment an	nd Annual Costs						
								shment at Indica				
ltem				0	6	12	18	24	30	36	42	48
						\$11,479,051	\$11,479,051	\$11,479,051	\$14,577,095	\$14,577,095	\$14,577,095	\$5,792,02
Construction Cost				\$28,450,674	\$11,479,051							
				\$28,450,674 \$147,735	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Construction Cost					\$0		\$0	\$0	\$0	\$0	\$0	\$0
Construction Cost Interest During Construction Total Investment Cost				\$147,735 \$28,598,409	\$0 \$11,479,051	\$0 \$11,479,051	\$0 \$11,479.051	\$0 \$11,479,051	\$0 \$14,577,095	\$0 \$14,577,095	\$0 \$14,577.095	\$0 \$5,792,025
Construction Cost Derest During Construction				\$147,735	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0

Average Annual Cost \$3,527,908 Interest Rate \$1,125%

Estimate of Contract and Construction Costs Pompano Beach/Lauderdate by the Cea 100 Acted Shoretine Width (f.) 4 Year Rendoutshmed Interval Project Life 50 year

							Project Life 50	· yra								
Item	Project Year	Unit Cost	Quantity	0	a	В	12	16	Renouris 20	shment at Indicat 24	ed Year 28	32	36	40	44	48
Journahment Mobilization/Demobilization	0	\$1,000,000	1	\$1,000,000		-										
Beach Fill		\$6 50	3,224,730	\$20,960,745												
Beach Tilling (ac) Hard Boltom Mitigation (ac)		\$300 \$360,000	80 3 12,0	\$24,104 \$3,500,000												
1st Renoudshment Mobilization/Demobilization	4	\$1,000,000	1		\$1,000,000											
Beach Fill Beach Tilling (sc)		\$6.50 \$300	746,320 80 3		\$4,864,080 \$24,104											
Hard Solton Miligation (ac)		\$300	au 3		\$0											
2nd Rengunshment Mobilization/Demobilization		\$1,000,000	1			\$1,000,000										
Beach Fill Beach Tilling (ac)		\$6.50 \$300	748,320 50.3			\$4,864,080 \$24,104										
Hard Boltom Miligation (ac)		4300	50.2			\$0										
3rd Renounsement Mobilization/Demobilization	12	\$1,000,000	1				51,000,000									
Beach Fi'l Beach Tilling (ac)		56 50 \$300	748,320 80.3	i			\$4,864,080 \$24,104									
Hard Beltom Miligation (ac) 4th Renousishment	16						50									
Mobilization/Demobilization		\$1,000,000	1					\$1,000,000								
Beach Fill Beach Tilling (sc)		\$6.50 530 0	748,320 80 3					\$4,664,080 \$24,104								
Hard Bottom Mitigation (ac) 5th Renourishment	20							\$3								
Mobilization/Demobilization Beach Fill		\$1,000.000 \$6.50	1 748.320						\$1,000,000 \$4,864,000							
Beach Tilling (ac)		\$300	80.3						524,104							
Hard Bottom Myligation (sc) 6th Renounshment	24								\$0							
Mobilization/Demobilization Beach Fill		\$1 000 000 \$6 50	1 748.320							\$1,000,000						
Beach Tilling (ec) Hard Boltom Mitigation (ac)		\$300	803	1						\$24,104 \$0						
7th Ranour shment	28										*****					
Mobilization/Demobilization Basch Fifl		\$1,000,000 \$6,50	748.320								\$1,000,000 \$4,964,080					
Beach Tisling (ec) Hard Soltom Mitigation (ec)		\$300	80.3								\$24,104 \$0					
Sth Renourshment Mobilization/Demobilization	32	\$1,000.000	1									\$1,000,000				
Beach Fel		\$8,50	748,320									\$6,360,720 \$24,104				
Beach Tilling (ac) Hard Soltom Miligation (ac)		\$300	80.3									\$24,104				
9tq Renourishment Mobilization/Demobilization	36	\$1,000,000	1										\$1,000,000			
Beach Fill Beach Tilling (sc)		\$8 50 \$300	748,320 80.3										\$6,360,720 \$24,104			
Hard Settern Mitigation (sc)		45010	30.3										\$0			
10th Renourishment Mobilization/Demobilization	40	\$1,000,000	1											\$1,300,300		
Geach Fill Beach Tilling (ac)		\$6.50 \$300	748,320 80.3											56,360,720 \$24,104		
Hard Bottom Mitigation (ac)		4000												50		
11th Renounshment Mobilization/Demobilization	44	\$1,000,000	1												\$1,000,000	
Beach Fill Beach Tilling (ac)		\$8 50 \$300	748,320 80.3												\$6,360,720 \$24,104	
Hetd Bottom Mitigation (ac) 12th Renourishment	46														\$0	
Mobilization/Demobilization Beach Fill		\$1,000,000 58.50	1 374, 160													\$1,000,000 \$3,180,360
Seach Tilling (ac)		\$300	71.8													\$21.468 \$0
Hard Sottom Mitigation (ac)																
Subtotal Contingency		15%		\$25,584,849 \$3.837.727	\$5,888,184 \$883,228	\$5,888,184 \$883.228	\$5,838,184 \$863,228	55,888,184 \$883,226	\$5,868,164 \$583,225	\$5,888,184 \$883,228	\$5,888,184 \$883,228	\$7,384,624 \$1,107,724	\$7,384,824 \$1,107,724	\$7,384,624 \$1,107,734	\$7,384,824 \$1,107,724	\$4,201,828 \$630,274
Sublotal Contract Cost			-	\$29,422,575	\$6,771,412	\$6,771,412	\$6,771,412	56.771,412	\$6,771.412	\$6,771,412	\$6,771,412	\$8,492,548	\$8,497,548	\$8,492,548	\$8,492,548	\$4,832,102
<u>.</u> .		entage of Contract	l Costs													
Nourschment E&D+S&A	J	10%	1	\$2,942,258												
1st Renourishment E&D+S&A	4	20%			\$1,354,282											
2nd Renourishment E&D+S&A		20%	,			\$1,354,282										
3rd Renounshment	12					u	h- ==-=									
E&D+S&A 4th Renourishment	16	20%	1				\$1,354,282									
E&D+S&A 5th Renou/ishmeni	20	20%	1					\$1,354,082								
E&D+S&A Sth Renounshment	24	20%	1						\$1,354,282							
E&D+S&A		20%	1							\$1,354,282						
7th Renourishment ESD+S&A	28	20%	1								\$1,354,282					
āth Renounshment E&D+S&A	32	20%	1									\$1,698,510				
9th Renounshment ESD+SSA	36	20%	1										\$1 698.613			
10th Renourishment	40												g r pag.ofd			
ESD+SSA Tiin Renourishmeni	44	20%	1											\$1,696,510		
E&D+S&A 12th Renourishment	48	20%	1												51,698,510	
E&D+S&A		20%	1													\$966,420
Total Construction Cost			·····	532,364,834	\$8,125,694	58.125,694	\$8.125.694	\$8,125,694	\$8,125,694	\$8,125,664	\$8,125,694	\$10,191,057	\$10,191,057	\$10.191.057	\$10,191.057	\$5,798,522
						Summa	ny-investment on	d Annual Costs								
llem				т —						ishment at indica						
Construction Cost				0 \$32,364,834	\$6,125,594	8 \$5:125.594	12 \$8,125,694	16 \$8,125,694	20 \$8,126,694	24 \$8,125,694	28 \$8,125,894	32 \$10,191,057	36 \$10,191,057	40 \$10,191.057	44 \$10,191,057	48 \$5,798,522
Interest During Construction				\$168,895	\$0	\$0	\$0,120,004	\$0	\$0	\$0	\$0	\$0	\$0	\$0	50	20
Total Investment Cost				\$32,533,729	\$8,125,694	\$8,125,684	40.000.000	10 101 001						4	\$10.191.057	\$5,798,522
							\$8,125,694	\$8,125,694	\$8,125,694	\$8,125,684	\$8,125,594	\$10, 191,057		\$10,191,057		
Present Worth of Each Construction Total Present Worth					\$6,406,340		\$3,981,512	\$3,136,696	\$8,125,694 \$2,474,608	\$8,125,684 \$1,950,903 \$81,818,232	\$8,125,894 \$1,538,030	\$1,520,732	\$1,198.897	\$945,173	\$745,144	\$334,247

 Average Annual Cost
 \$3,990,613

 Interest Rate
 6 125%

Estimate of Contract and Construction Costs Pompano Beach Lauderdale-by-the-Sea 100 Acaded Shoreline Width (It) 5 Year Renounshinent Interval Project Life 50 yrs

llem	Project Year	Unit Cost	Quantily						at Indicated Yea				
Nourishment	o o		- Country	0	5	10	15	20	25	30	35	40	45
Mobilization/Demobilization		\$1,000,000	1 2 111 810	\$1,000,000									
Beach Fill Beach Tilling (ac)		\$6,50 \$300	3,411,610 84.7	\$22,176,765 \$25,422									
Hard Bottom Mitigation (sc)		\$300,000	12.2	\$3,560,000									
1st Renourishment	5												
Mobilization/Demobilization Beach Fill		\$1,000,000 \$6,50	1 935,400		\$1,000,000 \$6,080,100								
Beach Tilling (ac)		\$300	84.7		\$25,422								
Hard Bottom Mitigation (ac)		•			SO								
2nd Renourishment	10					• • • • • • • • • • • • • • • • • • • •							
Mobilization/Demobilization Beach Fill		\$1,000,000 \$6,50	1 935,400			\$1,000,000 \$6,080,100							
Beach Tilling (ac)		\$300	84 7			\$25,422							
Haro Bottom Mitigation (ac)						\$0							
3rd Renourishment Mobilization/Demobilization	15	\$1,000,000					\$1,000,000						
Beach Fill		\$6.50	1 935,400				\$6,080,100						
Beach Tilling (ac)		\$300	84.7				\$25,422						
Hard Bottom Mitigation (ac)							50						
4th Renourishment Mobilization/Demobilization	20	\$1,000,000	1					\$1,000,000					
Beach Fill		\$6.50	935,400					\$6,080,100					
Beach Tilling (ac)		\$300	84.7					125,422					
Hard Bottom Mitigation (ac)	**							\$0					
5th Renourishment Mobilization/Demobilization	25	\$1,000,000	1						\$1,000,000				
Beach Fill		\$6.50	935,400						\$6,080,100				
Beach Tilling (ac)		\$300	84 7						\$25,422				
Hard Bottom Mitigation (ac)	20								\$0				
6th Renourishment Mobil:zation/Demobilization	30	\$1,000,000	1							\$1,000,000			
Beach Fill		\$8.50	935,400							\$7,950,900			
Beach Tilling (ac)		\$300	84.7	1						\$25,422			
Hard Bottom Miligation (ac) (th Renourishmen)	a r			İ						\$0			
Mobilization/Demobilization	35	\$1,000,000	1								\$1,000,000		
Beach Fill		\$8.50	935,400								\$7,950,900		
Beach Tilling (ac)		\$300	84.7								\$25,422		
Hard Bottom Mitigation (ac)	40										\$0		
Mobilization/Demobilization	40	\$1,000,000	1	<u> </u>								\$1,000,000	
Beach Fill		S8 50	935,400									\$7,950,900	
Beach Tilling (ac)		\$300	847									\$25,422	
Hard Bottom Mitigation (ac) 9th Renourishment	ıe			1								\$0	
Mobilization/Demobilization	45	\$1,000,000	1	ļ									\$1,000,00
Beach Fill		\$8.50	935,400	!									\$7,950,90
Beach Tilling (ac)		\$300	84.7	i									\$25,422
Hard Bottom Mitigation (ac)													\$D
Subtotal		4581		\$26,862,187	\$7,105,522	\$7,105,522	\$7,105,522	\$7,105,522	\$7,105,522	\$8,976,322	\$8,976,322	\$8,976,322	\$8,976,32
Sublotal Contract Cos:		15%		\$4.029,328 \$30,891.515	\$1,065,828 \$8,171,351	\$1,065.828 \$8,171,351	\$1.065,528 \$8,171,351	\$1,065,828 \$8,171,351	\$1,065,828 \$8,171,351	\$1,346,448 \$10,322,771	\$1,346,448 \$10,322,771	\$1,346,448 \$10,322,771	\$1,346,44 \$10,322,77
				Cub, us 1.01u	00,77 1,001	4 0,111, 4 01	40,111,001	\$5,111,001	54,771,551	\$10.0LL,711	ψ10,d22,171	\$10,022,711	#10.dLL,
		ntage of Contract	Costs										
Nourishment E&D+S&A	0	4.007		fra ana sea									
1st Renourishment	5	10%	1	\$3,089,152									
E&D+S&A		20%	1		\$1,634,270								
2nd Renourishment	10					2.22							
E&D+S&A 3rd Renourishment	15	20%	1			\$1,634,270							
E&D+S&A	13	20%	1				\$1.634,270						
Ith Renourishmeni	20						· · · · ·						
ESD+S&A		20%	1					\$1,634,270					
5th Renourishmenl E&D+S&A	25	20%	1						\$1,694,970				
ENDITSON Oth Renourishment	30	2J%	7						\$1,634,270				
E&D+S&A		20%	1							\$2,064,554			
7th Renourishment	35												
E&D+S&A 8th Renourishment	an	20%	1								\$2,064,554		
E8D+S&A	40	20%	1									\$2,084,554	
9th Renourishment	45	20,0	•										
E3D+S&A		20%	1										\$2,064,55
. Total Construction Cost				533,980,667	\$9,805,621	\$9,805.621	\$9.806,621	\$9,805.621	\$9,805,621	\$12,387,325	\$12,387,325	\$12,387,325	\$12,367,32
				,	iummary-Invest	ment and Annua	al Costs		· · · · · · · · · · · · · · · · · · ·				
иет				0	5	10	15	Renourishment 20	at Indicated Yea 25	30	35	40	45
Construction Cost				\$33,980,687 \$178,208	\$9,805,821 \$0	\$9,805,621 \$0	\$9,805,621	\$9,805,621 \$0	\$9,805,621 \$0	\$12,387,325 \$0	\$12,387,325 \$0	\$12,387,325 \$0	\$12,387,3 \$0
nierest During Construction							**						**
nlerest During Construction				D24 450 57	to per ce	E0 055 55			4 4 4 4 T T T T T T T T T T T T T T T T	E+0.00=	### ### ***	P+4 01= 11	*** ***
otal Investment Cost				\$34,158,874	\$9,805,621	\$9,805.621	\$9,805,621	\$9,805,621	\$9,805,621	\$12,387,325	\$12,387,325	\$12,387,325	\$12,387,3
nierest During Construction				\$34,158,874 \$34,158,874	\$9,805,621 \$7,284,279	\$9,805.621 \$5,411.256	\$9,805,621 \$4,019,847	\$2,988,215	\$9,805,821 \$2,218,362 09,519	\$12,387,325 \$2,081,836	\$12,387,325 \$1,546,528	\$12,387,325 \$1,148,866	\$12,387,3 \$853,45

Average Annual swist Interest Pale 53,933,595 5 125%

Esumale of Contract and Construction Costs Pompano BeachtLauderdale-by-the-Sea 100* Added Shoreline Widon (ft) 6 Year Renourishment Interval Project Life: 50 yrs

Item	Project Year	Unit Cast	Quantity	0	6	12		shment at Indica		36	42	48
ourishment	0		•	U		1,2	18	24	30	Jb	42	48
Mobilization/Demobilization	-	\$1,000,000	1	\$1,000,000								
Beach Fill		\$6.50	3,598,890	\$23,392,785								
Beach Tilling (ac)		\$300	89.1	\$26,740								
Hard Bottom Mitigation (ac)		\$300,000	12.5	\$3,750,000								
st Renourishment	6											
Mobilization/Demobilization		\$1,000,000	1		\$1,000,000							
Beach Fill		\$6.50	1,122,480		\$7,296,120							
Beach Tilling (ac)		\$300	89.1		\$26,740							
Hard Boltom Mitigation (ac)					\$0							
nd Renourishment	12											
Mobilization/Demobilization		\$1,000,000	1			\$1,000,000						
Beach Fill		\$6,50	1,122,480	}		\$7,296,120						
 Beach Tilling (ac) 		\$300	89.1	}		\$26,740						
Hard Bottom Mitigation (ac)				i		\$0						
rd Renourishment	18			l								
Mobilization/Demobilization		\$1,000,000	1				\$1,000,000					
- Beach Fill		. \$6.50	1,122,480	i			\$7,296,120					
Beach Tilling (ac)		\$300	89.1	i			\$26,740					
Hard Bottom Mitigation (ac)				i			\$0					
th Renourishment	24			1								
Mobilization/Demobilization		51,000,000	1	!				\$1,000,000				
Beach Filt		\$6.50	1,122,480	1				\$7,296,120				
Beach Tilling (ac)		\$300	89.1	1				\$26,740				
Hard Bottom Mitigation (ac)				l				sa				
th Renourishment	30			l								
Mobilization/Demobilization		\$1,000,000	1	1					\$1,000,000			
Beach Fill		\$8,50	1,122,480	1					\$9.541,080			
Beach Tilling (ac)		\$300	89.1	1					\$26,740			
Hard Bottom Mitigation (ac)				l					\$0			
th Renourishment	36			1								
Mobilization/Demobilization		\$1,000,000	1	1						\$1,000,000		
Beach Fill		\$8.50	1,122,480	ł						\$9,541,080		
Beach Tilling (ac)		\$300	89.1							\$26,740		
Hard Bottom Mitigation (ac)		****	••••	i						\$0		
h Renourishment	42			l						4.5		
Mobilization/Demobilization		\$1,000,000	1								\$1,000,000	
Seach Fill		\$8.50	1.122.480								\$9,541,080	
Beach Tilling (ac)		\$300	89.1	ľ							\$26,740	
Hard Bottom Mitigation (ac)		*	****								\$0	
th Renourishment	48										••	
Mobilization/Demobilization	,,,	\$1,000,000	1									\$1,000,000
Beach Fill		\$8.50	374,160	i								\$3,180,360
Seach Tilling (ac)		\$300	71.6									\$21,468
Hard Bottom Mitigation (ac)		0000										\$0
,				ļ								
Subtotal												
				\$28,169,525	\$8,322,860	\$8,322,860	\$8,322,860	\$8,322,860	\$10,567,820	\$10,567,820	\$10,567,820	\$4,201,82
		15%		\$28,169,525 \$4.225,429	\$1,248,429	\$8,322,860 \$1,248,429	\$8,322,860 \$1,248,429	\$8,322,860 \$1,248,429	\$10,567,820 \$1,585,173	\$10,567,820 \$1,585,173		
Ontingency Subtotal Contract Cost		15%										\$630,274
		15%		\$4.225,429	\$1,248,429	\$1,248,429	\$1,248,429	\$1,248,429	\$1,585,173	\$1,585,173	\$1,585,173	\$630,274
	Perce	15% ntage of Contract	Costs	\$4.225,429	\$1,248,429	\$1,248,429	\$1,248,429	\$1,248,429	\$1,585,173	\$1,585,173	\$1,585,173	\$630,274
Subtotal Contract Cost	Percei		Costs	\$4.225,429	\$1,248,429	\$1,248,429	\$1,248,429	\$1,248,429	\$1,585,173	\$1,585,173	\$1,585,173	\$630,274
Subtotal Contract Cost lourishment E&D+S&A			Costs	\$4.225,429	\$1,248,429	\$1,248,429	\$1,248,429	\$1,248,429	\$1,585,173	\$1,585,173	\$1,585,173	\$630,274
Subtotal Contract Cost lourishment E&D+S&A		ntaige of Contract		\$4.225,429 \$32,394,954	\$1,248,429	\$1,248,429	\$1,248,429	\$1,248,429	\$1,585,173	\$1,585,173	\$1,585,173	\$630,274
Subtotal Contract Cost ourishment E&D+S&A	0	ntaige of Contract		\$4.225,429 \$32,394,954	\$1,248,429	\$1,248,429	\$1,248,429	\$1,248,429	\$1,585,173	\$1,585,173	\$1,585,173	\$630,274
Subtotal Contract Cost lourishment E&D+S&A st Renourishment E&D+S&A	0	ntage of Contract	1	\$4.225,429 \$32,394,954	\$1,248,428 \$9,571,289	\$1,248,429	\$1,248,429	\$1,248,429	\$1,585,173	\$1,585,173	\$1,585,173	\$630,274
Subtotal Contract Cost lourishment E&D+S&A st Renourishment E&D+S&A	0 6	ntage of Contract	1	\$4.225,429 \$32,394,954	\$1,248,428 \$9,571,289	\$1,248,429	\$1,248,429	\$1,248,429	\$1,585,173	\$1,585,173	\$1,585,173	\$630,274
Subtotal Contract Cost lourishment E&D+S&A st Renourishment E&O+S&A and Renourishment E&O+S&A	0 6	ntaige of Contract 10% 20%	1	\$4.225,429 \$32,394,954	\$1,248,428 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429	\$1,248,429	\$1,585,173	\$1,585,173	\$1,585,173	\$630,274
Subtotal Contract Cost ourishment E&0+S&A st Renourishment E&0+S&A nd Renourishment E&0+S&A rd Renourishment E&0+S&A	0 6 12	ntaige of Contract 10% 20%	1	\$4.225,429 \$32,394,954	\$1,248,428 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429	\$1,248,429	\$1,585,173	\$1,585,173	\$1,585,173	\$630,274
Subtotal Contract Cost ourishment E&0+S&A st Renourishment E&0+S&A nd Renourishment E&0+S&A rd Renourishment E&0+S&A	0 6 12	ntage of Contract 10% 20% 20%	1 1 1	\$4.225,429 \$32,394,954	\$1,248,428 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429	\$1,585,173	\$1,585,173	\$1,585,173	\$630,274
Subtotal Contract Cost ourishment E&0+S&A st Renourishment E&0+S&A nd Renourishment E&0+S&A rd Renourishment E&0+S&A	0 6 12 18	ntage of Contract 10% 20% 20%	1 1 1	\$4.225,429 \$32,394,954	\$1,248,428 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429 \$9,571,289	\$1,585,173	\$1,585,173	\$1,585,173	\$630,274
Subtotal Contract Cost ourishment E&0+S&A st Renourishment E&0+S&A nd Renourishment E&0+S&A dd Renourishment E&0+S&A dd Renourishment E&0+S&A th Renourishment E&0+S&A	0 6 12 18	ntage of Contract 10% 20% 20% 20%	1 1 1	\$4.225,429 \$32,394,954	\$1,248,428 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429	\$1,585,173	\$1,585,173	\$1,585,173	\$630,274
Subtotal Contract Cost fourishment E&0+S&A st Renourishment E&0+S&A and Renourishment E&0+S&A and Renourishment E&0+S&A and Renourishment E&0+S&A th Renourishment E&0+S&A	0 6 12 18 24	ntage of Contract 10% 20% 20% 20% 20%	1 1 1 1	\$4.225,429 \$32,394,954	\$1,248,428 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429 \$9,571,289	\$1,585,173 \$12,152,993	\$1,585,173	\$1,585,173	\$630,274
Subtotal Contract Cost lourishment E&D+S&A st Renourishment E&D+S&A nd Renourishment E&D+S&A rd Renourishment E&D+S&A rd Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A	0 6 12 18 24 30	ntage of Contract 10% 20% 20% 20%	1 1 1	\$4.225,429 \$32,394,954	\$1,248,428 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429 \$9,571,289	\$1,585,173	\$1,585,173	\$1,585,173	\$630,274
Subtotal Contract Cost lourishment E&0+S&A st Renourishment E&0+S&A and Renourishment E&0+S&A and Renourishment E&0+S&A th Renourishment E&0+S&A th Renourishment E&0+S&A th Renourishment	0 6 12 18 24	ntage of Contract 10% 20% 20% 20% 20% 20%	1 1 1 1 1	\$4.225,429 \$32,394,954	\$1,248,428 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429 \$9,571,289	\$1,585,173 \$12,152,993	\$1,585,173 · S12,182,993	\$1,585,173	\$630,274
Subtotal Contract Cost lourishment E&D+S&A st Renourishment E&O+S&A nd Renourishment E&O+S&A rd Renourishment E&D+S&A th Renourishment E&O+S&A	0 8 12 18 24 30 36	ntage of Contract 10% 20% 20% 20% 20%	1 1 1 1	\$4.225,429 \$32,394,954	\$1,248,428 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429 \$9,571,289	\$1,585,173 \$12,152,993	\$1,585,173	\$1,585,173	\$630,274
Subtotal Contract Cost lourishment E&D+S&A st Renourishment E&O+S&A nd Renourishment E&O+S&A rd Renourishment E&D+S&A th Renourishment E&O+S&A	0 6 12 18 24 30	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	1 1 1 1 1 1 1 1 1	\$4.225,429 \$32,394,954	\$1,248,428 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429 \$9,571,289	\$1,585,173 \$12,152,993	\$1,585,173 · S12,182,993	\$1,585,173 \$12,152,993	\$630,274
Subtotal Contract Cost lourishment E&D+S&A st Renourishment E&D+S&A and Renourishment E&D+S&A and Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment	0 8 12 18 24 30 36	ntage of Contract 10% 20% 20% 20% 20% 20%	1 1 1 1 1	\$4.225,429 \$32,394,954	\$1,248,428 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429 \$9,571,289	\$1,585,173 \$12,152,993	\$1,585,173 · S12,182,993	\$1,585,173	\$630,274
lourishment E&D+S&A st Renourishment E&D+S&A and Renourishment E&D+S&A and Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment	0 6 12 18 24 30 36 42	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	1 1 1 1 1 1 1	\$4.225,429 \$32,394,954	\$1,248,428 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429 \$9,571,289	\$1,585,173 \$12,152,993	\$1,585,173 · S12,182,993	\$1,585,173 \$12,152,993	\$4,201,622 \$630,274 \$4,832,10
Subtotal Contract Cost lourishment E&D+S&A st Renourishment E&D+S&A and Renourishment E&D+S&A and Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment	0 6 12 18 24 30 36 42	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	1 1 1 1 1 1 1 1 1	\$4.225,429 \$32,394,954	\$1,248,428 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429 \$9,571,289	\$1,585,173 \$12,152,993	\$1,585,173 · S12,182,993	\$1,585,173 \$12,152,993	\$630,274
Subtotal Contract Cost ourishment E&D+S&A st Renourishment E&D+S&A dd Renourishment E&D+S&A dd Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A	0 6 12 18 24 30 36 42	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	1 1 1 1 1 1 1	\$4.225.429 \$32,394,964 \$3,239,495	\$1,248,428 \$9,571,289 \$1,914,258	51,248,429 \$9,571,289 \$1,914,258	\$1,248,429 \$9,571,289 \$1,914,258	\$1,248,429 \$9,571,289 \$1,914,258	\$1,585,173 \$12,152,993 \$2,430,599	\$1,585,173 \$12,152,993 \$12,152,993 \$2,430,599	\$1,585,173 \$12,152,993 \$2,430,599	\$630,274 \$4,832,10
Subtotal Contract Cost purishment E&D+S&A If Renourishment E&D+S&A Ind Renourishment E&D+S&A If Renourishment E&D+S&A Renourishment E&D+S&A Renourishment E&D+S&A Renourishment E&D+S&A Renourishment E&D+S&A Renourishment E&D+S&A Renourishment E&D+S&A Renourishment E&D+S&A Renourishment	0 6 12 18 24 30 36 42	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	1 1 1 1 1 1 1	\$4.225,429 \$32,394,954	\$1,248,428 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429 \$9,571,289	\$1,248,429 \$9,571,289	\$1,585,173 \$12,152,993	\$1,585,173 · S12,182,993	\$1,585,173 \$12,152,993	\$630,274 \$4,832,10
Subtotal Contract Cost ourishment E&D+S&A st Renourishment E&D+S&A dd Renourishment E&D+S&A dd Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A	0 6 12 18 24 30 36 42	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	1 1 1 1 1 1 1	\$4.225.429 \$32,394,954 \$3,239,495 \$3,239,495	\$1,248,428 \$9,571,289 \$1,914,258 \$1,914,258	\$1,248,429 \$9,571,289 \$1,914,256 \$11,485,547	\$1,248,429 \$9,571,289 \$1,914,258	\$1,248,429 \$9,571,289 \$1,914,258	\$1,585,173 \$12,152,993 \$2,430,599	\$1,585,173 \$12,152,993 \$12,152,993 \$2,430,599	\$1,585,173 \$12,152,993 \$2,430,599	\$630,274 \$4,832,10
Subtotal Contract Cost lourishment E&D+S&A st Renourishment E&O+S&A nd Renourishment E&D+S&A nd Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A	0 6 12 18 24 30 36 42	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	1 1 1 1 1 1 1	\$4.225.429 \$32,394,954 \$3,239,495 \$3,239,495	\$1,248,428 \$9,571,289 \$1,914,258	\$1,248,429 \$9,571,289 \$1,914,256 \$11,485,547	\$1,248,429 \$9,571,289 \$1,914,258	\$1,248,429 \$9,571,289 \$1,914,258	\$1,585,173 \$12,152,993 \$2,430,599	\$1,585,173 \$12,152,993 \$12,152,993 \$2,430,599	\$1,585,173 \$12,152,993 \$2,430,599	\$630,274 \$4,832,10
Subtotal Contract Cost fourishment E&0+S&A st Renourishment E&0+S&A and Renourishment E&0+S&A and Renourishment E&0+S&A th Renourishment E&0+S&A th Renourishment E&0+S&A th Renourishment E&0+S&A th Renourishment E&0+S&A th Renourishment E&0+S&A th Renourishment E&0+S&A th Renourishment E&0+S&A th Renourishment E&0+S&A th Renourishment E&0+S&A Total Construction Cost	0 6 12 18 24 30 36 42	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	1 1 1 1 1 1 1	\$4.225.429 \$32,394,954 \$3,239,495 \$3,239,495	\$1,248,428 \$9,571,289 \$1,914,258 \$1,914,258	\$1,248,429 \$9,571,289 \$1,914,256 \$11,485,547	\$1,248,429 \$9,571,289 \$1,914,258 \$1,914,258	\$1,248,429 \$9,571,289 \$1,914,258 \$11,485,547	\$1,585,173 \$12,152,993 \$2,430,599 \$14,583,592	\$1,585,173 \$12,152,993 \$12,152,993 \$2,430,599	\$1,585,173 \$12,152,993 \$2,430,599	\$630,274 \$4,832,10
Subtotal Contract Cost ourishment E&D+S&A st Renourishment E&D+S&A dd Renourishment E&D+S&A dd Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A the Renourishment E&D+S&A	0 6 12 18 24 30 36 42	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	1 1 1 1 1 1 1	\$4.225.429 \$32,394,954 \$3,239,495 \$3,239,495 \$35,634,450 Summan	\$1,248,428 \$9,571,289 \$1,914,258 \$11,485,547 \$	\$1,248,429 \$9,571,289 \$1,914,256 \$11,485,547 d Annual Costs	\$1,248,429 \$9,571,289 \$1,914,258 \$11,485,547	\$1,248,429 \$9,571,289 \$1,914,258 \$11,485,547	\$1,585,173 \$12,152,993 \$2,430,599 \$14,583,592	\$1,585,173 \$12,152,993 \$2,430,599 \$14,583,592	\$1,585,173 \$12,152,993 \$2,430,599 \$14,583,592	\$630,274 \$4,832,10 \$986,420 \$5,798,52
Subtotal Contract Cost lourishment	0 6 12 18 24 30 36 42	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	1 1 1 1 1 1 1	\$4.225.429 \$32,394,964 \$3,239,495 \$3,239,495 \$35,634,450 Summan	\$1,248,429 \$9,571,289 \$1,914,258 \$11,485,547 y-Investment an	\$1,248,429 \$9,571,289 \$1,914,258 \$11,485,547 d Annual Costs	\$1,248,429 \$9,571,289 \$1,914,258 \$11,485,547 Renoun:	\$1,248,429 \$9,571,289 \$1,914,258 \$11,485,547	\$1,585,173 \$12,152,993 \$2,430,599 \$14,583,592	\$1,585,173 \$12,152,993 \$12,152,993 \$2,430,599 \$14,583,592	\$1,585,173 \$12,152,993 \$2,430,599 \$14,583,592	\$630,274 \$4,832,10 \$4,832,10 \$986,420 \$5,798,52
Subtotal Contract Cost ourishment E&D+S&A If Renourishment E&D+S&A nd Renourishment E&D+S&A id Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A th Renourishment E&D+S&A Total Construction Cost Item onstruction Cost	0 6 12 18 24 30 36 42	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	1 1 1 1 1 1 1	\$4.225.429 \$32,394,964 \$3,239,496 \$3,239,496 \$35,634,450 Summan	\$1,248,428 \$9,571,289 \$1,914,258 \$1,914,258 \$11,485,547 y-investment an	\$1,248,429 \$9,571,289 \$1,914,258 \$11,485,547 d Annual Costs	\$1,248,429 \$9,571,289 \$1,914,258 \$11,485,547 Renoura 18 \$11,485,547	\$1,248,429 \$9,571,289 \$1,914,258 \$11,485,547 \$hment at Indica 24 \$11,485,547	\$1,585,173 \$12,152,993 \$12,152,993 \$2,430,699 \$14,583,592 Ited Year 30 \$14,583,592	\$1,585,173 \$12,152,993 \$12,152,993 \$2,430,599 \$14,583,592	\$1,585,173 \$12,152,993 \$2,430,599 \$14,583,592 42 \$14,583,592	\$630,274 \$4,832,10 \$4,832,10 \$956,420 \$5,798,52
Subtotal Contract Cost ourishment E&D+S&A It Renourishment E&D+S&A Ind Renourishment E&D+S&A Ind Renourishment E&D+S&A Ind Renourishment E&D+S&A Ind Renourishment E&D+S&A In Renourishment E&D+S&A In Renourishment E&D+S&A In Renourishment E&D+S&A In Renourishment E&D+S&A Total Construction Cost	0 6 12 18 24 30 36 42	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	1 1 1 1 1 1 1	\$4.225.429 \$32,394,964 \$3,239,495 \$3,239,495 \$35,634,450 Summan	\$1,248,429 \$9,571,289 \$1,914,258 \$11,485,547 y-Investment an	\$1,248,429 \$9,571,289 \$1,914,258 \$11,485,547 d Annual Costs	\$1,248,429 \$9,571,289 \$1,914,258 \$11,485,547 Renoun:	\$1,248,429 \$9,571,289 \$1,914,258 \$11,485,547	\$1,585,173 \$12,152,993 \$2,430,599 \$14,583,592	\$1,585,173 \$12,152,993 \$12,152,993 \$2,430,599 \$14,583,592	\$1,585,173 \$12,152,993 \$2,430,599 \$14,583,592	\$630,274 \$4,832,10 \$986,420 \$5,798,52
Subtotal Contract Cost ourishment E&D+S&A It Renourishment E&D+S&A and Renourishment E&D+S&A d Renourishment E&D+S&A h Renourishment E&D+S&A h Renourishment E&D+S&A h Renourishment E&D+S&A h Renourishment E&D+S&A h Renourishment E&D+S&A Total Construction Cost Item oustruction Cost terest During Construction	0 6 12 18 24 30 36 42	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	1 1 1 1 1 1 1	\$4.225.429 \$32,394,964 \$3,239,495 \$3,239,495 Summan 0 \$35,634,450 \$186,881	\$1,248,428 \$9,571,289 \$1,914,258 \$11,485,547 y-investment an 6 \$11,485,547 \$0	\$1,248,429 \$9,571,289 \$1,914,258 \$1,914,258 \$1,485,547 \$0	\$1,248,429 \$9,571,289 \$1,914,258 \$11,485,547 Renour: 18 \$11,485,547	\$1,248,429 \$9,571,289 \$1,914,258 \$11,485,547 \$11,485,547 \$11,485,547	\$1,585,173 \$12,152,993 \$12,152,993 \$2,430,599 \$14,583,592 \$14,583,592 \$0	\$1,585,173 \$12,152,993 \$12,152,993 \$2,430,599 \$14,583,592 \$0 \$14,583,592	\$1,585,173 \$12,152,993 \$2,430,599 \$14,583,592 42 \$14,583,592 \$0	\$630,274 \$4,832,10 \$4,832,10 \$966,420 \$5,798,52 48 \$5,798,52
Subtotal Contract Cost ourishment E&D+S&A if Renourishment E&D+S&A nd Renourishment E&D+S&A d Renourishment E&D+S&A h Renourishment E&D+S&A h Renourishment E&D+S&A h Renourishment E&D+S&A h Renourishment E&D+S&A h Renourishment E&D+S&A Total Construction Cost Item	0 6 12 18 24 30 36 42	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	1 1 1 1 1 1 1	\$4.225.429 \$32,394,964 \$3,239,496 \$3,239,496 \$35,634,450 Summan	\$1,248,428 \$9,571,289 \$1,914,258 \$1,914,258 \$11,485,547 y-investment an	\$1,248,429 \$9,571,289 \$1,914,258 \$11,485,547 d Annual Costs	\$1,248,429 \$9,571,289 \$1,914,258 \$11,485,547 Renoura 18 \$11,485,547	\$1,248,429 \$9,571,289 \$1,914,258 \$11,485,547 \$hment at Indica 24 \$11,485,547	\$1,585,173 \$12,152,993 \$12,152,993 \$2,430,699 \$14,583,592 Ited Year 30 \$14,583,592	\$1,585,173 \$12,152,993 \$12,152,993 \$2,430,599 \$14,583,592	\$1,585,173 \$12,152,993 \$2,430,599 \$14,583,592 42 \$14,583,592	\$630,274 \$4,832,10 \$4,832,10 \$956,420 \$5,798,52
Subtotal Contract Cost builshment	0 6 12 18 24 30 36 42	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20%	1 1 1 1 1 1 1	\$4.225.429 \$32,394,964 \$3,239,495 \$3,239,495 Summan 0 \$35,634,450 \$186,881	\$1,248,428 \$9,571,289 \$1,914,258 \$11,485,547 y-investment an 6 \$11,485,547 \$0	\$1,248,429 \$9,571,289 \$1,914,258 \$1,914,258 \$1,485,547 \$0	\$1,248,429 \$9,571,289 \$1,914,258 \$11,485,547 Renour: 18 \$11,485,547	\$1,248,429 \$9,571,289 \$1,914,258 \$11,485,547 \$11,485,547 \$11,485,547	\$1,585,173 \$12,152,993 \$12,152,993 \$2,430,599 \$14,583,592 \$14,583,592 \$0	\$1,585,173 \$12,152,993 \$12,152,993 \$2,430,599 \$14,583,592 \$0 \$14,583,592	\$1,585,173 \$12,152,993 \$2,430,599 \$14,583,592 42 \$14,583,592 \$0	\$630,274 \$4,832,10 \$956,420 \$5,798,52 48 \$5,798,52

 Average Annual Cest
 \$3,995,099

 Interest Rate
 6.125%

Estimate of Cantract and Canstruction Costs Porpatio Brach-Louderdale-by-the Can 135 Addes Shoreline Width (ft) 4 Year Penc Justinest Interval Project Life: 50 yrs

Basch Fills (94) 1370 87.7 BBS 174										-							
Control Cont			Unit Cost	Quantity	0 .	4	8	12	. 16				32	36	46	44	48
Series of the se		0	51 000 000		\$1,000,000												
Service of the control of the contro	Beach Fill		\$8.50	3.843,833	524,984,911												
The content of the	Beach Tilling (ec)		\$300	96 0	\$28,812												
Seminonity of the control of the con	Hard Bottom Mitigation (sc)	A	2300,000	20.6	\$6,180,000												
Part	Mobilization/Earnobilization	-	\$1,000,000	1	1	\$1,000,000											
The content	- Besch Fill		\$6.50			54,864,050											
Second	Hard Bottom Mitigation (ac)		\$300	90.0	i												
March Marc	rid Renounshment	8															
The control of the co	Mobilization/Demobilization		\$1,000,000	1 748 120			\$1,000,000										
Second Second	Beach Tilling (ac)		\$300				\$28,812										
March Marc	Hard Bottom Mutgetion (ac)						\$0										
March Marc	ara kengunanmeni Mobilization/Demobilization	12	\$1,000,000	1				\$1,000,000									
Control Cont	Beach Fill		\$6.50	748,320				\$4,864,080									
18 - Merchanter 19			\$300	96.0													
Machine Mach	ih Renoudshmeni	16						•									
Part		•		1	1				\$1,000,000								
## Company of the Com	Beach Filling (ac.)				İ				\$25.612								
Marketonic mediate of the property of the prop	Hard Sottom Mitigation (ac)		•														
Base Property 19 19 19 19 19 19 19 19 19 19 19 19 19	Sth Renoushment	20	T4 000 000							F4 600 600							
## Control Property of the Con	Beach Fall		\$6 50							\$4.854.080							
18	Beach Tilling (ac)									\$25,812							
Meditasson-development all political properties of the properties	Hard Bottom Milipation (ac) Bih Renousshmeni	24								20							
See See See See See See See See See See	Mobilization/Demobilization			1							\$1,000,000						
The following Magner (ac) 1000,000 1 10000,000 1 1000,000 1 10000,000 1 1000,000 1 1000,000 1 1000,000 1 1000,000 1 1000,000 1 1000,																	
Processor Proc			\$30II	96.0													
Banker Till 1968	7th Renoudshmeni	28															
Processor Note Processor	Mobilization/Demobilization Beach F#I		\$1,000,000 \$6.50	1 748 330								\$1.080,080 \$4.864.087					
15 - March 15	Beach Tilling (ac)											\$28,812					
Maritan Marita	Hard Bottom Mitigation (ac)	20															
Base 18 13 13 13 13 13 13 13	Mobilization/Demobilization	32	\$1,000,000	1									\$1,000,000				
Part State	Beach Fill		29 20										\$6,360,720				
The Presentation 1	Beach Tilling (ac) Hard Rottom Milication (ac)		\$300	96.0													
March State March State	th Renourishment	36											40				
Separate Proper plane of the proper plane of t	Mobilization/Demobilization		\$1,000,000	1										\$1,000,000			
### Bloome Misspan (region of the property of																	
March 19	Hard Bottom Mitigation (ac)		*														
Bases Pffing Lee \$150 \$200 \$10 \$100		40															
Sear-Timp (pc) 500 800 800 800 800 800 800 800 800 800															\$1,000,000		
15 Resident Milegania (16 10 10 10 10 10 10 10 10 10 10 10 10 10	Beach Tilling (ac)																
Media Paris Miller 1 1900 1 1 1 1900 1 1 1 1900 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1 1900 1 1900 1 1 1900	Hard Bottom Mitigation (ac)														\$0		
Beach Filing (are) 150 24,000 26 27 27 27 27 27 27 27	1 th Renourishment Mobilization/Demobilization	44	\$1 000 000	1												\$1,000,000	
Table Part	Beach Fill		\$8.50	748,320												\$6,360,720	
1222 Percentation 1 1 1 1 1 1 1 1 1	Beach Tilling (ac)		5300	96 0													
Basch File See 374 690 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	12th Renourishment	48														-	
Besch Talling (see) 19/2																	\$1,000,00 \$3,180,36
Part																	\$26,175
Cessing-region 15%	Hard Settom Mitigation (ac)																\$0
Cessing-region 15%	Subjoint				532 193 773	\$5,892,892	55 692 692	35 892 892	\$5,892,892	\$5,892,892	55 692 692	\$5,892,892	57 388 532	\$7,389,532	\$7,389,530	\$7,359,532	\$4,206,53
Subtail Contract Cost Percentage of Contract Costs Percentage of			15%														\$630,98
Novashment 0	Sublatal Contract Cost				537,022,782	\$6,776,526	56.776,826			\$6,776,326							\$4 637,5
Novashment 0 1 5 18 Renovashment 4 1 5 1.355.365		Parce	enlane of Contract	Costs													
181 Removalshment																	
E80-56A 20% 1 \$1,355,365 for Renouliment 6	ERD+S&A		10%	1	\$3,702,278												
The Renoulishment 6 E ED-16A	ist Henourishmeni E&D+S&4	4	20%	4		\$1,356,366											
## Present 12	2nd Renourishment	6				+.10001003											
## Fanoushirment ## 10 ## 1 ## 1,355,365 ## 1,355,365 ## 1 ## 1,355,365 ## 1,355,365 ## 1 ## 1,355,365 ## 1,355,365 ## 1 ## 1,355,365 #			20%	1			\$1.355.365										
In Renountainment 16	FE MERIOUNSHMENT E&D+S&A	12	20%	1				\$1,355,365									
\$16 Remountment 20 \$1,955,365 \$ \$16 Remountment 24 \$1,955,365 \$ \$16 Remountment 24 \$1,955,365 \$ \$17 Remountment 28 \$1,955,365 \$ \$1,890,592	4th Renounshment	16															
ESD-93A 20% 1		70	20%	1					\$1,355,365								
September 19	um reunoun soment ESD+S&A	20	20%	1						\$1,355,365							
The Remountshipment 20	5th Renounshment	24															
EAC+SEA 20% 1 S1,355,355 8th Renoulishment 32 S1,699,562 9th Renoulishment 30 S1,699,562 9th Renoulishment 40 S1,699,562 1109 Renoulishment 40 S1,699,562 1119 Renoulishment 41 S1,699,562 1119 Renoulishment 41 S1,699,562 1120 Renoulishment 41 S1,699,562 1120 Renoulishment 41 S1,699,562 1120 Renoulishment 41 S1,699,562 1120 Renoulishment 41 S1,699,562 1120 Renoulishment 41 S1,699,562 1120 Renoulishment 41 S1,699,562 1120 Renoulishment 41 S1,699,562 1120 Renoulishment 41 S1,699,562 1120 Renoulishment 41 S1,699,562 1120 Renoulishment 41 S1,699,562 1120 Renoulishment 41 S1,699,562 1120 Renoulishment 41 S1,699,562 1120 Renoulishment 41 S1,699,562 1120 Renoulishment 41 S1,699,562 1220 Renoulishmen		78	20%	1							\$1,355,385						
## Removishment 12	E&D+S&A	_	20%	1								\$1,355,365					
## Princips 10	8th Renoutlahment	32											** ***				
## 260-956A	ESU+SSA Pth Renourishment	36	20%	1]								\$1,099,59Z				
EACH-SEA 20% 1 S1,599,592 113 Renoulthrent 44 EACH-SEA 20% 1 S1,599,592 125 Renoulthrent 44 EACH-SEA 20% 1 S1,599,592 126 Renoulthrent 49 EACH-SEA 20% 1 S40,725,880 58,132,191 58,132,191 58,132,191 58,132,191 58,132,191 58,132,191 51,197,554 510,197,55	E&D+S&A		20%	1										\$1,699,592			
119 Renoulshrent 41	10th Renourishment EAD+SEA	40	20th	4	1										\$1,600.500		
EACH-SEA 20% 1 12th Renounthheres 49 EACH-SEA 20% 1 Total Construction Cest 540,725,860 58,132,191 58,132,191 58,132,191 58,132,191 58,132,191 58,132,191 58,132,191 58,132,191 58,132,191 510,197,554	11⊅ Renourishment	44		,											41,433,432		
EAC+SSA 20% 1 Total Construction Cest 540,725,060 58,132,191 58,132,191 \$8,132,191 \$8,132,191 \$8,132,191 \$8,132,191 \$10,197,554 \$10,197,5	E&D+S&A		20%	1												\$1,699,592	
Total Construction Cost		48	20%														\$967,50
Summary-Investment and Annual Costs Summary-Investment and Annual				<u>, , , , , , , , , , , , , , , , , , , </u>													
	Total Construction Cost				\$40,725.060	\$8, 132, 191	\$8,132,191	\$6,132,191	\$8,132,191	58, 132, 191	\$8,132,191	\$8,132,191	\$10,197.554	\$10,197,554	\$10.197.554	\$10,197,554	\$5,805,0
Idem 0 4 8 12 16 20 24 28 32 35 40 44							Summa	y-investment an	d Annual Costs								
0 4 8 12 16 20 24 23 32 38 40 44 Construction Cost 540,725,060 58 12 191 56,132,191 58,132,191 56,132,191 56,132,191 56,132,191 56,132,191 57,152 570,197,554 510								,									
Construction Cost 1 549/75/505 58.132.191 59	ltem					,		47	10		nment at Incica		20	- 50	an .	41	48
Interest During Constitution 5214,638 50 50 50 50 50 50 50 50 50 50 50 50 50	Construction Cost					58, 132, 191	\$8,132,191	\$8,132,191					\$10,197.554	\$10,197,554			\$5,805,0
Total Investment Cent \$40,039.688 \$8,132.181 \$6,132.191 \$6,132.191 \$6,132.181 \$4,132.191 \$6,132.191 \$10,187.554 \$10,187.554 \$10,197.554 \$1																	\$0
Present North of Eath Construction 51,032,069,060 53,141,408 52,475 559 51,532,069 51,532,102 51,532,069 51,532,103 51,532,069 51,53						\$8,132,181	\$6,132,191	\$8,132.194	\$8,132,191	\$8,132,181	\$6,132.191	\$8,132,191	\$10,197.554	\$10,197.554	\$10,197.554	\$10,197.554	\$5,305,0
Total Passent Words	Present Worth of Each Construction						\$5,051,357				\$1,952,462						\$334,62
The state of the s	otal Pisseni Worth		-								\$70,247,008						

Average Annual Cost \$4,534,724 (Mereal) Pare 6.125%

Estimate of Contract and Construction Costs Pompano Beach/Lauderda e-by-the-Sea 125° Added Shoreline Width (ft) 5 'ear Renounstruent interval Project Life: 50 yrs

	Project Year	· Unit Cost	Quantity					Renourishment a					
ltem Nourishment	C Project rear	Onn Cost	Guarinty	0	5	10	15	20	25	30	35	40	45
Mobilization/Cemobilization	•	\$1,000,000	1	\$1,000,000									
Beach Fill		\$6.50	4,030,913	\$25,200,931									
Beach Tilling (ac)		\$300	100.4	\$30,130									
Hard Sottom Mitigation (ac) st Renourishment	5	. \$300,000	20.9	\$6,270,000									
Mobilization/Demobilization	•	\$1,000,000	1		\$1,000,000								
Beach Fill		\$6.50	935,400		\$6,080,100								
Beach Tilling (ac)		\$300	100.4		\$30,130								
Hard Boltom Mitigation (ac)					\$3								
Ind Renourishment	10												
Mobilization/Demobilization Beach Fill		\$1,000,000 \$6.50	1 935,400			\$1,000,000 \$6,080,100							
Beach Tilling (ac)		\$300	100.4			\$30,130							
Hard Boltom Mitigation (ac)		\$40 5				\$0							
Ird Renourishment	15			ļ									
Mobilization/Demobilization		\$1,000,000	1	1			\$1,000,000						
Beach Fill		\$8.50	935,400				\$6,080,100						
Beach Tilling (ac) Hard Bottom Miligation (ac)		\$300	100.4				\$30,130 \$0						
The Renourishment	20						40						
Mobilization/Demobilization	20	\$1,000,000	1					\$1,000,000					
Beach Fill		\$8,50	935,400					\$6,080,100					
Beach Tilling (ac)		\$300	100,4					\$30,130					
Hard Bottom Mitigation (ac)								\$0					
th Renourishment	25	£4.005.000		1					#4.000 = 25				
Mobilization/Demobilization Beach Fill		\$1,000,000 \$6,50	1 935,400	I					\$1,000,000 \$6,080,100				
Beach Filling (ac)		\$5.50 \$300	935,400	I					\$5,080,100 \$30,130				
Hard Bottom Mitigation (ac)		4000	100,4	I					\$0 \$0				
Sh Renourishment	30			1									
Mobilization/Demobilization		\$1,000,000	1	1						\$1,000,000			
Beach Fill		\$8 50	935,400	i						\$7,950,900			
Beach Tilling (ac)		\$300	100.4	1						\$30,130			
Hard Bottom Mitigation (ac) th Renounshment	35			1						\$0			
tn Kendurishment Mobilization/Demobilization	35	\$1,000,000	1	1							\$1,000,000		
Beach Fill		\$8.50	935,400	1							\$7,950,900		
Beach Tilling (ac)		\$300	100.4								\$30,130		
Hard Bottom Miligation (ac)											\$0		
th Renourishment	40												
Mobilization/Demobilization		\$1,000,000	1									\$1,000,000	
Beach Fill		\$8.50	935,400									\$7,960,900 \$30,130	
Beach Tilling (ac)		\$300	100.4									\$30,130	
Hard Bottom Mitigation (ac) Th Renourishment	45											40	
Mobilization/Demobilization		\$1,000,000	1										\$1,000,00
Seach Fill		\$8.50	935,400										\$7,950,90
Beach Tilling (ac)		\$300	100 4										\$30,130
Hard Bettern Mitigation (ac)													
													\$D
Subtotat				\$33,501,081	\$7,110,230	\$7,110,230	\$7,110,230	\$7,110,230	\$7,110,230	\$8,981,030	\$8,981,030	\$8,981,030	
Subtotat Contingericy		15%		\$5,025,159	\$1,066,535	\$1,066,535	\$1,096,535	\$1,DG5,535	\$1,066,535	\$1,347,155	\$1,347,155	\$1,347,155	\$8,981,03 \$1,347,15
Subtotat		15%											\$8,981,03 \$1,347,15
Subtotat Contingency			Contra	\$5,025,159	\$1,066,535	\$1,066,535	\$1,096,535	\$1,DG5,535	\$1,066,535	\$1,347,155	\$1,347,155	\$1,347,155	\$8,981,03 \$1,347,15
Subtotal Contingency Subtotal Contract Cost		15% ntage of Contract	Costs	\$5,025,159	\$1,066,535	\$1,066,535	\$1,096,535	\$1,DG5,535	\$1,066,535	\$1,347,155	\$1,347,155	\$1,347,155	\$8,981,03 \$1,347,15
Subtotat Contingericy Subtotal Contract Cost Nourishment	Perce 0	ntage of Contract		\$5,025,159 \$38,526,220	\$1,066,535	\$1,066,535	\$1,096,535	\$1,DG5,535	\$1,066,535	\$1,347,155	\$1,347,155	\$1,347,155	\$8,981,03 \$1,347,15
Subtotal Contingency Subtotal Contract Cost Nourishment E8D+S&/			Costs 1 ·	\$5,025,159	\$1,066,535	\$1,066,535	\$1,096,535	\$1,DG5,535	\$1,066,535	\$1,347,155	\$1,347,155	\$1,347,155	\$8,981,03 \$1,347,15
Subtotal Contingericy Subtotal Contract Cost Nourishment E8D+S84 Ist Renourishment E8D+S8A	0 5	ntage of Contract		\$5,025,159 \$38,526,220	\$1,066,535	\$1,066,535	\$1,096,535	\$1,DG5,535	\$1,066,535	\$1,347,155	\$1,347,155	\$1,347,155	\$8,981,03 \$1,347,15
Subtotat Contingency Subtotal Contract Cost Nourishment E8D+S&/ lst Renourishment E8D+S&A 2nd Renourishment	0	ntage of Contract 10% 20%	1 ·	\$5,025,159 \$38,526,220	\$1,056,535 \$8,176,765	\$1,066,535 \$8,176,766	\$1,096,535	\$1,DG5,535	\$1,066,535	\$1,347,155	\$1,347,155	\$1,347,155	\$8,981,03 \$1,347,15
Subtotal Contingency Subtotal Contract Cost Nourishment E8D+8&/ 1st Renourishment E4D+8AA 2nd Renourishment E6D+8AA	0 5 10	ntage of Contract	1 .	\$5,025,159 \$38,526,220	\$1,056,535 \$8,176,765	\$1,066,535	\$1,096,535	\$1,065,535	\$1,066,535	\$1,347,155	\$1,347,155	\$1,347,155	\$8,981,03 \$1,347,15
Subtotal Subtotal Contract Cost Subtotal Contract Cost Nourishment E8D+S&A and Renourishment E6D+S&A and Renourishment	0 5	ntage of Contract 10% 20% 20%	1 - 1 1	\$5,025,159 \$38,526,220	\$1,056,535 \$8,176,765	\$1,066,535 \$8,176,766	\$1,096,535 \$8,176,765	\$1,065,535	\$1,066,535	\$1,347,155	\$1,347,155	\$1,347,155	\$8,981,03 \$1,347,15
Subtotal Contingency Subtotal Contract Cost Nourishment E8D+S8/ Ist Renourishment E8D+S8A 2nd Renourishment E6D+S8A drd Renourishment E6D+S8A	0 5 10 15	ntage of Contract 10% 20%	1 ·	\$5,025,159 \$38,526,220	\$1,056,535 \$8,176,765	\$1,066,535 \$8,176,766	\$1,096,535	\$1,065,535	\$1,066,535	\$1,347,155	\$1,347,155	\$1,347,155	\$8,981,03 \$1,347,15
Subtotal Contingency Subtotal Contract Cost Nourishment E&D+S&/ 1st Renourishment E&D+S&A and Renourishment E&D+S&A and Renourishment E&D+S&A and Renourishment E&D+S&A and Renourishment E&D+S&A and Renourishment	0 5 10	ntage of Contract 10% 20% 20% 20%	1 · 1 1	\$5,025,159 \$38,526,220	\$1,056,535 \$8,176,765	\$1,066,535 \$8,176,766	\$1,096,535 \$8,176,765	\$1,099,535 \$8,178,785	\$1,066,535	\$1,347,155	\$1,347,155	\$1,347,155	\$8,981,03 \$1,347,15
Subtotat Subtotat Contract Cost Subtotal Contract Cost Nourishment E8D+S8/ 1st Renourishment E8D+S8A 2nd Renourishment E6D+S8A 3rd Renourishment E6D+S8A 4th Renourishment E6D+S8A	0 5 10 15 20	ntage of Contract 10% 20% 20%	1 - 1 1	\$5,025,159 \$38,526,220	\$1,056,535 \$8,176,765	\$1,066,535 \$8,176,766	\$1,096,535 \$8,176,765	\$1,DG5,535	\$1,066,535	\$1,347,155	\$1,347,155	\$1,347,155	\$8,981,03 \$1,347,15
Subtotat Subtotat Contract Cost Subtotal Contract Cost Nourishment E8D+S8/ 1st Renourishment E8D+S8A 2nd Renourishment E6D+S8A 3rd Renourishment E6D+S8A 4th Renourishment E6D+S8A	0 5 10 15	ntage of Contract 10% 20% 20% 20%	1 · 1 1	\$5,025,159 \$38,526,220	\$1,056,535 \$8,176,765	\$1,066,535 \$8,176,766	\$1,096,535 \$8,176,765	\$1,099,535 \$8,178,785	\$1,066,535	\$1,347,155	\$1,347,155	\$1,347,155	\$8,981,03 \$1,347,15
Subtetal Contingency Subtotal Contract Cost Nourishment E8D+S&/ 1st Renourishment E8D+S&A 2nd Renourishment E8D+S&A 4nd Renourishment E8D+S&A 5th Renourishment E8D+S&A 5th Renourishment E8D+S&A 5th Renourishment E8D+S&A 5th Renourishment E8D+S&A 5th Renourishment	0 5 10 15 20	ntage of Contract 10% 20% 20% 20% 20% 20%	1 - 1 1 1	\$5,025,159 \$38,526,220	\$1,056,535 \$8,176,765	\$1,066,535 \$8,176,766	\$1,096,535 \$8,176,765	\$1,099,535 \$8,178,785	\$1,066,536 \$8,176,785	\$1,347,185 \$10,328,185	\$1,347,155	\$1,347,155	\$8,981,03 \$1,347,15
Subtotal Contingency Subtotal Contract Cost Nourishment E&D+S&/ at Renourishment E&D+S&A and Renourishment E&D+S&A ard Renourishment E&D+S&A at Renourishment E&D+S&A at Renourishment E&D+S&A at Renourishment E&D+S&A at Renourishment E&D+S&A at Renourishment E&D+S&A at Renourishment E&D+S&A at Renourishment E&D+S&A bit Renourishment E&D+S&A	0 5 10 15 20 25 30	ntage of Contract 10% 20% 20% 20% 20%	1 - 1 1 1	\$5,025,159 \$38,526,220	\$1,056,535 \$8,176,765	\$1,066,535 \$8,176,766	\$1,096,535 \$8,176,765	\$1,099,535 \$8,178,785	\$1,066,536 \$8,176,785	\$1,347,155	\$1,347,155	\$1,347,155	\$0 \$8,981,03 \$1,047,15 \$10,328,14
Subtotal Contingency Subtotal Contract Cost Nourishment E8D+S&/ 1st Renourishment E8D+S&A 2nd Renourishment E8D+S&A 3rd Renourishment E8D+S&A 5th Renourishment E8D+S&A 5th Renourishment E8D+S&A 5th Renourishment E8D+S&A 5th Renourishment E8D+S&A 5th Renourishment E8D+S&A 5th Renourishment E8D+S&A 5th Renourishment E8D+S&A 5th Renourishment E8D+S&A 5th Renourishment	0 5 10 15 20 25	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20%	1 · 1 1 1 1 1 1 1	\$5,025,159 \$38,526,220	\$1,056,535 \$8,176,765	\$1,066,535 \$8,176,766	\$1,096,535 \$8,176,765	\$1,099,535 \$8,178,785	\$1,066,536 \$8,176,785	\$1,347,185 \$10,328,185	\$1,347,185 \$10,328,185	\$1,347,155	\$8,981,03 \$1,347,15
Subtotal Contingericy Subtotal Contract Cost Subtotal Contract Cost Nourishment E8D+S&/ Ist Renourishment E8D+S&A Sid Renourishment E8D+S&A Sid Renourishment E8D+S&A Sid Renourishment E8D+S&A Sid Renourishment E8D+S&A Sid Renourishment E8D+S&A Contraction C8D+S&A C8D+S&A C8D+S&A C8D+S&A C8D+S&A C8D+S&A C8D+S&A C8D+S&A C8D+S&A C8D+S&A C8D+S&A C8D+S&A C8D+S&A	0 5 10 15 20 25 30	ntage of Contract 10% 20% 20% 20% 20% 20%	1 · · · · · · · · · · · · · · · · · · ·	\$5,025,159 \$38,526,220	\$1,056,535 \$8,176,765	\$1,066,535 \$8,176,766	\$1,096,535 \$8,176,765	\$1,099,535 \$8,178,785	\$1,066,536 \$8,176,785	\$1,347,185 \$10,328,185	\$1,347,155	\$1,347,155	\$8,981,03 \$1,347,15
Subtotal Contingency Subtotal Contract Cost Nourishment E8D+S&/ 1st Renourishment E8D+S&A 2nd Renourishment E8D+S&A 3rd Renourishment E5D+S&A 3rd Renourishment E5D+S&A 3th Renourishment E5D+S&A 5th Renourishment E5D+S&A 5th Renourishment E6D+S&A 5th Renourishment	0 5 10 15 20 25 30	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20%	1 - 1 1 1 1 1 1 1 1	\$5,025,159 \$38,526,220	\$1,056,535 \$8,176,765	\$1,066,535 \$8,176,766	\$1,096,535 \$8,176,765	\$1,099,535 \$8,178,785	\$1,066,536 \$8,176,785	\$1,347,185 \$10,328,185	\$1,347,185 \$10,328,185	\$1,347,155 \$10,328,185	\$8,981,03 \$1,347,15
Subtotal Contingency Subtotal Contract Cost Subtotal Contract Cost Nourishment E8D+S&/ Ist Renourishment E8D+S&A Ord Renourishment E8D+S&A Sith Renourishment E8D+S&A Sith Renourishment E8D+S&A Sith Renourishment E8D+S&A Sith Renourishment E8D+S&A Sith Renourishment E8D+S&A Sith Renourishment E8D+S&A Sith Renourishment E8D+S&A Sith Renourishment E8D+S&A Sith Renourishment E8D+S&A	0 5 10 15 20 25 30 35 40	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20%	1 · 1 1 1 1 1 1 1	\$5,025,159 \$38,526,220	\$1,056,535 \$8,176,765	\$1,066,535 \$8,176,766	\$1,096,535 \$8,176,765	\$1,099,535 \$8,178,785	\$1,066,536 \$8,176,785	\$1,347,185 \$10,328,185	\$1,347,185 \$10,328,185	\$1,347,155	\$8,981,03 \$1,347,15
Subtotal Contingericy Subtotal Contract Cost Subtotal Contract Cost Nourishment E8D+S&/ at Renourishment E8D+S&A and Renourishment E8D+S&A ath Renourishment E8D+S&A ath Renourishment E8D+S&A ath Renourishment E8D+S&A ath Renourishment E8D+S&A ath Renourishment E8D+S&A ath Renourishment E8D+S&A ath Renourishment E8D+S&A ath Renourishment E8D+S&A	0 5 10 15 20 25 30	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20%	1 - 1 1 1 1 1 1 1 1	\$5,025,159 \$38,526,220	\$1,056,535 \$8,176,765	\$1,066,535 \$8,176,766	\$1,096,535 \$8,176,765	\$1,099,535 \$8,178,785	\$1,066,536 \$8,176,785	\$1,347,185 \$10,328,185	\$1,347,185 \$10,328,185	\$1,347,155 \$10,328,185	\$8,981,03 \$1,047,1 <u>5</u> \$10,325,1
Subtotal Contingericy Subtotal Contract Cost Subtotal Contract Cost Accurishment E8D+S8/ st Renourishment E8D+S8A and Renourishment E8D+S8A th Renourishment E8D+S8A th Renourishment E8D+S8A th Renourishment E8D+S8A th Renourishment E8D+S8A th Renourishment E8D+S8A th Renourishment E8D+S8A th Renourishment E8D+S8A	0 5 10 15 20 25 30 35 40	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	1	\$5.025,159 \$36,528,220 \$3,852,622	\$1,095,535 \$8,176,765 \$1,835,363	\$1,086,536 \$8,176,766 \$1,635,352	\$1,636,535 \$8,176,765 \$1,635,353	\$1,005.535 \$6,178,765 \$1,835.353	\$1,006,536 \$8,176,785	\$1,347,155 \$10,328,185	\$1,347,165 \$10,328,185	\$1,347,155 \$10,328,185	\$8,981,03 \$1,347,13 \$10,325,1
Subtotal contingency Subtotal Contract Cost fourishment E8D+S&F st Renourishment E8D+S&A and Renourishment E8D+S&A ft Renourishment E8D+S&A th Renourishment E8D+S&A th Renourishment E8D+S&A th Renourishment E8D+S&A th Renourishment E8D+S&A th Renourishment E8D+S&A th Renourishment E8D+S&A th Renourishment E8D+S&A th Renourishment E8D+S&A th Renourishment E8D+S&A th Renourishment E8D+S&A th Renourishment E8D+S&A th Renourishment E8D+S&A th Renourishment E8D+S&A th Renourishment	0 5 10 15 20 25 30 35 40	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	1	\$5,025,159 \$38,526,220	\$1,056,535 \$8,176,765	\$1,066,535 \$8,176,766	\$1,096,535 \$8,176,765	\$1,099,535 \$8,178,785	\$1,066,536 \$8,176,785	\$1,347,185 \$10,328,185	\$1,347,165 \$10,328,185	\$1,347,155 \$10,328,185	\$8,981,03 \$1,347,13 \$10,325,1
Subtotal Contingericy Subtotal Contract Cost Subtotal Contract Cost Nourishment E8D+S&/ Ist Renourishment E8D+S&A And Renourishment E8D+S&A Ath Renourishment E8D+S&A Ath Renourishment E8D+S&A Ath Renourishment E8D+S&A Ath Renourishment E8D+S&A Ath Renourishment E8D+S&A Ath Renourishment E8D+S&A Ath Renourishment E8D+S&A Ath Renourishment E8D+S&A Ath Renourishment E8D+S&A Ath Renourishment E8D+S&A Ath Renourishment E8D+S&A Ath Renourishment E8D+S&A	0 5 10 15 20 25 30 35 40	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	1	\$5.025,159 \$36,528,220 \$3,852,622 \$42,378,843	\$1,695,535 \$8,176,765 \$1,635,363 \$1,635,363 \$9,612,117	\$1,085,535 \$0,176,766 \$1,835,352 \$1,835,352	\$1,636,365 \$8,176,765 \$1,635,363 \$1,635,363	\$1,005.535 \$6,178,765 \$1,835.353	\$1,006,536 \$8,176,785	\$1,347,155 \$10,328,185	\$1,347,165 \$10,328,185	\$1,347,155 \$10,328,185	\$8,981,03 \$1,047,15 \$10,328,1
Subtotal Contingency Subtotal Contract Cost Subtotal Contract Cost Nourishment E8D+S&/ Ist Renourishment E8D+S&A 3rd Renourishment E8D+S&A 4th Renourishment E8D+S&A 5th Renourishment E8D+S&A 5th Renourishment E8D+S&A 5th Renourishment E8D+S&A 6th Renourishment E8D+S&A 6th Renourishment E8D+S&A 6th Renourishment E8D+S&A 6th Renourishment E8D+S&A 6th Renourishment E8D+S&A 6th Renourishment E8D+S&A 6th Renourishment E8D+S&A	0 5 10 15 20 25 30 35 40	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	1	\$5.025,159 \$36,528,220 \$3,852,622 \$42,378,843	\$1,695,535 \$8,176,765 \$1,635,363 \$1,635,363 \$9,612,117	\$1,086,536 \$8,176,766 \$1,635,352	\$1,636,365 \$8,176,765 \$1,635,363 \$1,635,363	\$1,005.535 \$6,178,765 \$1,635,353 \$1,635,353 \$9,812,117	\$1,006,536 \$8,176,765 \$1,635,353 \$1,635,353	\$1,347,155 \$10,328,185 \$2,065,637 \$12,393,821	\$1,347,165 \$10,328,185	\$1,347,155 \$10,328,185	\$8,981,03 \$1,347,15
Subtotal Contingericy Subtotal Contract Cost Subtotal Contract Cost Nourishment E8D+S&/ Ist Renourishment E8D+S&A Sid Renourishment E8D+S&A Sid Renourishment E8D+S&A Sid Renourishment E8D+S&A Sid Renourishment E8D+S&A Sid Renourishment E8D+S&A Sid Renourishment E8D+S&A Sid Renourishment E8D+S&A Sid Renourishment E8D+S&A Sid Renourishment E8D+S&A Sid Renourishment E8D+S&A Sid Renourishment E8D+S&A Sid Renourishment E8D+S&A Sid Renourishment E8D+S&A	0 5 10 15 20 25 30 35 40	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	1	\$5.025,159 \$36,529,220 \$3,852,622 \$42,378,843	\$1,695,535 \$8,176,765 \$1,635,353 \$1,635,353 \$8,612,117 Summary-Invest	\$1,035,035 \$8,176,765 \$1,635,352 \$9,812,117	\$1,636,355 \$8.176,765 \$1,636,353 \$1,636,353	\$1,005.535 \$6,178,765 \$1,835,353 \$1,835,353	\$1,006,536 \$8,176,765 \$1,635,353 \$9,812.117	\$1,347,155 \$10,328,185 \$2,065,637 \$12,393,821	\$1,347,165 \$10,328,185 \$2,065,637 \$12,393,821	\$1,347,155 \$10,328,185 \$2,065,637 \$12,393,821	\$8,981,03 \$1,047,15 \$10,325,11 \$2,065,63
Subtotal Contingency Subtotal Contract Cost Nourishment E8D+S&/ Ist Renour-shment E6D+S&A and Renourishment E6D+S&A th Renourishment E6D+S&A Total Construction Cost	0 5 10 15 20 25 30 35 40	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	1	\$5.025,159 \$36,528,220 \$3,852,622 \$42,378,543	\$1,695,535 \$8,176,765 \$1,635,353 \$1,635,353 \$2,612,117 \$2,612,117	\$1,085,535 \$8,176,766 \$1,635,352 \$1,635,352 \$1,635,352 \$1,635,352	\$1,635,353 \$8,176,765 \$1,635,353 \$1,635,353 \$1,635,353 \$1,635,353	\$1,005.535 \$6,178,765 \$1,635,353 \$1,635,353 \$9,812,117 Renourishment 20 \$9,812,117	\$1,006,536 \$8,176,765 \$1,635,353 \$1,635,353 \$1,635,353 at Indicated Yea 25 \$9,812,117	\$1,347,155 \$10,328,185 \$10,328,185 \$2,065,637 \$12,393,821	\$1,347,165 \$10,328,185 \$10,328,185 \$2,065,637 \$12,393,821	\$1,347,155 \$10,328,185 \$2,065,637 \$12,393,821	\$8,981,03 \$1,047,15 \$10,325,1 \$10,325,1 \$12,393,6
Subtotal Contingency Subtotal Contract Cost Nourishment E8D+S64 st Renourishment E8D+S8A and Renourishment E8D+S8A drd Renourishment E8D+S8A drt Renourishment E8D+S8A th Renourishment E8D+S8A th Renourishment E8D+S8A th Renourishment E8D+S8A th Renourishment E8D+S8A th Renourishment E8D+S8A th Renourishment E8D+S8A th Renourishment E8D+S8A th Renourishment E8D+S8A th Renourishment E8D+S8A th Renourishment E8D+S8A th Renourishment E8D+S8A th Renourishment E8D+S8A th Renourishment E8D+S8A Total Construction Cost	0 5 10 15 20 25 30 35 40	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	1	\$5.025,159 \$36,528,220 \$3,852,622 \$3,852,622 \$42,378,843 \$224,464	\$1,635,353 \$3,176,765 \$1,635,353 \$1,635,353 \$1,635,363 \$1,635,363 \$1,635,363	\$1,085,535 \$3,176,766 \$1,635,352 \$1,635,352 \$1,635,352 \$1,635,352 \$1,635,352 \$1,635,352	\$1,636,363 \$8,176,765 \$1,635,363 \$1,635,363 \$1,635,363 \$1,635,363	\$1,005.535 \$6,178,765 \$1,635,353 \$1,635,353 \$9,612,117 Renourishment 20 \$9,612,117 \$0	\$1,006,536 \$8,176,785 \$1,635,353 \$1,635,353 \$1,635,353 at Indicated Yea 25 \$9,812,117 \$0	\$1,347,155 \$10,328,185 \$10,328,185 \$2,065,637 \$12,393,821 \$12,393,821 \$0	\$1,347,165 \$10,328,185 \$10,328,185 \$2,065,637 \$12,393,821 \$5 \$12,393,821 \$0	\$1,347,155 \$10,328,185 \$2,065,637 \$12,393,821 40 \$12,393,821 \$0	\$8,981,03 \$1,047,15 \$10,325,1 \$10,325,1 \$12,393,8 \$12,393,8 \$12,393,8
Subtotal Contingency Subtotal Contract Cost dourniment E8D+S64 st Renounshment E8D+S8A nd Renounshment E8D+S8A th Renounshment E8D+S8A th Renounshment E8D+S8A th Renounshment E8D+S8A th Renounshment E8D+S8A th Renounshment E8D+S8A th Renounshment E8D+S8A th Renounshment E8D+S8A th Renounshment E8D+S8A th Renounshment E8D+S8A th Renounshment E8D+S8A th Renounshment E8D+S8A th Renounshment E8D+S8A th Renounshment E8D+S8A th Renounshment E8D+S8A th Renounshment E8D+S8A Total Construction Cost	0 5 10 15 20 25 30 35 40	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	1	\$5.025,159 \$36,529,220 \$3,852,622 \$3,852,622 \$42,378,643 \$42,378,643 \$224,464 \$42,603,306	\$1,635,363 \$1,635,363 \$1,635,363 \$2,612,117 \$2,812,117 \$5,812,117 \$0,812,117	\$1,085,535 \$3,176,766 \$1,835,352	\$1,636,353 \$8,176,765 \$1,635,353	\$1,005.535 \$6,178,765 \$1,635,353 \$1,635,353 \$9,812,117 Renourishment 20 \$9,812,117 \$0 \$9,812,117	\$1,006,536 \$8,176,765 \$1,635,353	\$1,347,155 \$10,328,185 \$10,328,185 \$2,065,637 \$12,393,821 \$12,393,821 \$0 \$12,393,821	\$1,347,165 \$10,328,185 \$10,328,185 \$2,065,637 \$12,393,821 \$12,393,821 \$0 \$12,393,821	\$1,347,155 \$10,328,185 \$10,328,185 \$2,065,637 \$12,393,821 \$0 \$12,393,821	\$2,065,63 \$12,393,8 \$12,393,8
Subtotal contingency Subtotal Contract Cost fourishment E8D+S&f st Renourishment E8D+S&A nd Renourishment E8D+S&A dt Renourishment E8D+S&A th Renourishment E8D+S&A th Renourishment E8D+S&A th Renourishment E8D+S&A th Renourishment E8D+S&A th Renourishment E8D+S&A th Renourishment E8D+S&A th Renourishment E8D+S&A th Renourishment E8D+S&A Total Construction Cost	0 5 10 15 20 25 30 35 40	ntage of Contract 10% 20% 20% 20% 20% 20% 20% 20% 20% 20% 2	1	\$5.025,159 \$36,528,220 \$3,852,622 \$3,852,622 \$42,378,843 \$224,464	\$1,635,353 \$3,176,765 \$1,635,353 \$1,635,353 \$1,635,363 \$1,635,363 \$1,635,363	\$1,085,535 \$3,176,766 \$1,635,352 \$1,635,352 \$1,635,352 \$1,635,352 \$1,635,352 \$1,635,352	\$1,636,363 \$8,176,765 \$1,635,363 \$1,635,363 \$1,635,363 \$1,635,363	\$1,005.535 \$8,178,765 \$1,635,353 \$1,635,353 \$1,635,353 \$9,812,117 20 \$9,812,117 \$9,842,117 \$2,968,193	\$1,006,536 \$8,176,785 \$1,635,353 \$1,635,353 \$1,635,353 at Indicated Yea 25 \$9,812,117 \$0	\$1,347,155 \$10,328,185 \$10,328,185 \$2,065,637 \$12,393,821 \$12,393,821 \$0	\$1,347,165 \$10,328,185 \$10,328,185 \$2,065,637 \$12,393,821 \$5 \$12,393,821 \$0	\$1,347,155 \$10,328,185 \$2,065,637 \$12,393,821 40 \$12,393,821 \$0	\$8,981.0 \$1,347,1 \$10,325,1 \$10,325,1 \$12,393,6 \$12,393,6 \$12,393,6

Average Annual Cost nterest Rate \$4,529,845 6 125%

Estimate of Contract and Construction Costs Pompano Beach/Lauderdate-by-the-Sen 125' Added Shoreline Widor (t) 6 Year Renounishment Interval Project Life: 50 yrs

łtem	Project Year	Unit Cost	Quantity	0	6	12	Renouri: 18	shment at Indica 24	ted Year 30	36	42	48
Vourishment	0							·				
Mobilization/Demobilization		\$1,000,000	1	\$1,000,000								
Beach Fill		\$6.50	4,217,993	\$27,416,951								
Beach Tilling (ac) Hard Bottom Miligation (ac)		\$300 \$300,000	104.8 20.8	\$31,448 \$6,240,000								
1st Renourishment	6	\$200,000	20.6	\$6,240,000								
Mobilization/Demobilization	Ü	\$1,000,000	1		\$1,000,000							
Beach Fill		\$6.50	1,122,480		\$7,296,120							
Beach Tilling (ac)		\$300	104.8		\$31,448							
Hard Bottom Mitigation (ac)					\$0							
2nd Renourishment	12											
Mobilization/Demobilization		\$1,000,000	1			\$1,000,000						
Beach Fill		\$6.50	1,122,480			\$7,296,120						
Beach Tilling (ac)		\$300	104.8			\$31,448						
Hard Bottom Mitigation (ac)	40					\$0						
3rd Renourishment Mobilization/Demobilization	18	\$1,000,000	1				\$1,000,000					
Beach Fill		\$1,000,000 \$6.50	1,122,480				\$7,296,120					
Beach Tilling (ac)		\$300	104.8				\$31,448					
Hard Bottom Mitigation (ac)		\$500	104.0				50					
4th Renourishment	24						- -					
Mobilization/Demobilization		\$1,000,000	1					\$1,000,000				
Beach Fill		\$6.50	1,122,480	1				\$7,296,120				
Beach Tilling (ac)		\$300	104.B	1				\$31,448				
Hard Bottom Mitigation (ac)				1				\$0				
5th Renourishment	30	** ***		1								
Mobilization/Demobilization		\$1,000,000	1 422 100	1					\$1,000,000			
Beach Fill		\$8.50 \$300	1,122,480 104.8	1					\$9,541,080 \$31,448			
Beach Tilling (ac) Hard Bottom Miligation (ac)		a suu	104.8	1					\$31,448 \$0			
6th Renourishment	36			1					φV			
Mobilization/Demobilization	50	\$1,000,000	1							\$1,000,000		
Beach Fill		\$8.50	1,122,480							\$9,541,080		
Beach Tilling (ac)		\$300	104.8							\$31,448		
Hard Bottom Miligation (ac)										\$0		
7th Renourishment	42											
Mobilization/Demobilization		\$1,000,000	1								\$1,000,000	
Beach Fill		\$8.50	1,122,480								\$9,541,080	
Beach Tilling (ac)		\$300	104.8								\$31,448	
Hard Bottom Mitigation (ac)											\$0	
8th Renourishment Mobilization/Demobilization	48	\$1,000.000	1									\$1,000,000
Beach Fill		\$8.50	374,160									\$3,180,360
Beach Tilling (ac)		\$300	87.3	ļ								\$26,175
Hard Bottom Mitigation (ac)		4000		,								\$0
Subtotal				\$34,688,399	\$8,327,568	\$8,327,568	\$8,327,568	\$8,327,568	\$10,572,528	\$10,572,528	\$10,572,528	\$4,206,535
Contingency		15%		\$5,203,260	\$1,249,135	\$1,249,135	\$1,249,135	\$1,249,135	\$1.585,879	\$1,585,879	\$1,585,879	\$630,980
Sublotal Contract Cost				\$39,691,659	\$9,576,703	\$9,576,703	\$9,576,703	\$9,576,703	\$12,158,407	\$12,158,407	\$12,158,407	\$4,837,516
	-			1								
*		entage of Contract	Costs	1								
Nourishment E&D+S&A	0	10%	1	\$3,989,166								
1st Renourishment	5	10%	'	\$2,508,100								
E&D+S&A	5	20%	1	1	\$1,915,341							
2nd Renourishment	12	-279	•	1	Ţ.,_ JG,D * I							
E&D+S&A		20%	1	1		\$1,915,341						
3rd Renourishment	18			1								
E&D+S&A		20%	1	1			\$1.915.341					
4th Renourishment	24			1								
E&D+S&A		20%	1	1				\$1,915,341				
5th Renourishment	30	0000		1					# D 401 501			
E&D+S&A	36	20%	1	1					\$2,431,681			
6th Renourishment E&D+S&A	3b	20%		1						\$2,431,681		
E&D+S&A 7th Renourishment	42	∠11%	1	1						94,43T,00T		
E&D+S&A	42	20%	1	1							\$2,431,681	
Bth Renourishment	48	2370	'	1							WE175 14001	
	••	20%	1	1								\$967,503
E&D+S&A												
				\$43,880,825	\$11,492,044	\$11,492,044	\$11,492,044	\$11,492,044	\$14,590,089	\$14,590,089	\$14,590,089	\$5,805,019
E&D+S&A												
E&D+S&A				Summar	y-Investment an	nd Annual Costs						
E&D+S&A Tetal Construction Cost				Summar	y-Investment an	d Annual Costs		shment at Indica	ited Year			· · · · · ·
E&D+S&A Total Construction Cost				0	6	12	Renouri 18	24	30	36	42	48
E&D+S&A Total Construction Cost Item Construction Cost				0 \$43,880,825	6 \$11,492,044	12 \$11,492,044	Renours 18 \$11,492,044	24 \$11,492,044	30 \$14,590,089	\$14,590,089	\$14,590,089	\$5,805,019
E&D+S&A Total Construction Cost				0	6	12	Renouri 18	24	30			
E&D+S&A Total Construction Cost them Construction Cost Interest During Construction				0 \$43,880,825 \$233,574	6 \$11,492,044 \$0	12 \$11,492,044 \$0	Renours 18 \$11,492,044 - \$0	24 \$11,492,044 \$0	30 \$14,590,089 \$0	\$14,590,089 \$0	\$14,590,089 \$0	\$5,805,019 \$0
E&D+S&A Total Construction Cost Item Construction Cost				0 \$43,880,825	6 \$11,492,044	12 \$11,492,044	Renours 18 \$11,492,044	24 \$11,492,044	30 \$14,590,089	\$14,590,089	\$14,590,089	\$5,805,019
E&D+S&A Total Construction Cost Item Construction Cost Interest During Construction				0 \$43,880,825 \$233,574	6 \$11,492,044 \$0	12 \$11,492,044 \$0	Renours 18 \$11,492,044 - \$0	24 \$11,492,044 \$0	30 \$14,590,089 \$0	\$14,590,089 \$0	\$14,590,089 \$0	\$5,805,019 \$0
E&D+S&A Total Construction Cost Item Construction Cost Interest During Construction Total Investment Cost	_			0 \$43,880,825 \$233,574 \$44,114,399	6 \$11,492,044 \$0 \$11,492,044	12 \$11,492,044 \$0 \$11,492,044	Renours 18 \$11,492,044 \$0 \$11,492,044	24 \$11,492,044 \$0 \$11,492,044	30 \$14,590,089 \$0 \$14,590,089	\$14,590,089 \$0 \$14,590,089	\$14,590,089 \$0 \$14,590,089	\$5,805,019 \$0 \$5,805.019

 Average Annual Cost
 \$4,531,371

 Interest Rate
 6,125%

 PiBro

SUB-APPENDIX A-3

DETAILED COST ESTIMATES FOR EVALUATION OF THE WIDTH OF THE MODIFICATION TO THE FEDERAL PROJECT

Sub-Apendix A-3

Modification to the Federal Project Optimization Summary

[1
Baseline	South Project	Nourishment	Annualized
Extension (ft)	Limit	Interval (yrs)	Costs
1	R-74	11	\$1,018,000
1	R-74	12	\$1,016,000
1	R-74	13	\$1,017,000
20	R-74	11	\$1,455,000
20	R-74	12	\$1,455,000
20	R-74	13	\$1,457,000
25	R-74	10	\$1,575,000
25	R-74	11	\$1,574,000
25	R-74	12	\$1,574,000
50	R-74	9	\$2,203,000
50	R-74	10	\$2,202,000
50	R-74	11	\$2,204,000

Fort Lauderdale

Baseline Extension (ft)	South Project Limit	Nourishment Interval (yrs)	Annualized Costs	Primary Benefits (mean)	Net Benefits
1	R-74	12	\$1,016,000	\$2,007,000	\$991,000
20	R-74	12	\$1,455,000	\$2,773,000	\$1,318,000
25	R-74	11	\$1,574,000	\$2,923,000	\$1,349,000
50	R-74	10	\$2,202,000	\$3,419,000	\$1,217,000

Estimate of Contract and Construction Costs Ft Lauderdale 1' Added Shoreline Width (ft) to R-74 Renourishment Interval: 11 yrs Project Life: 18 years

ltem	Project Year	Unit Cost	Quantity	Renourishment at Indicated Year 2002	rt Indicated Year 2013
Mobilization		\$1,000,000	-	\$1,000,000	\$1,000,000
Reach 3 Beach Fill (cy)	0	\$9.00	485,078	\$4,365,699	
	1	\$9.00	288,850		\$2,599,646
Beach Tilling (ac)		\$300	0.5	\$145	\$145
Hard Bottom Mitigation (ac)		\$300,000	4.0	\$1,188,940	-
Subtotal				\$6,554,784	\$3,599,792
Contingency		15%		\$983,218	\$539,969
Subtotal Contract Cost				\$7,538,002	\$4,139,761
Nourishment					
E&D+S&A		10%	-	\$753,800	
1st Renourishment					
E&D+S&A		20%	1		\$827,952
Total Construction Cost				\$8,291,802	\$4,967,713
	Summary-Investment and Annual Costs	nent and Annual	Costs		
Item				Renourishment at Indicated Year 2002	it Indicated Year 2013
Construction Cost				\$8,291,802	\$4,967,713
Interest During Construction				\$41,384	\$0
Total Investment Cost				\$8,333,185	\$4,967,713
Present Worth of Each Construction				\$8,333,185	\$2,583,222
Total Present Worth				\$10,916,407	6,407

\$1,017,686	6.125%	
Average Annual Cost	Interest Rate	

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Estimate of Contract and Construction Costs Ft Lauderdale 1' Added Shoreline Width (ft) to R-74 Renourishment Interval: 12 yrs Project Life: 18 years

Mobilization \$1,000,000 Reach 3 Beach Fill (cy) 0 \$9.00 505 Beach Tilling (ac) \$300 268 Hard Bottom Mitigation (ac) \$300,000 4 Hard Bottom Mitigation (ac) \$300,000 4 Contingency \$15% 15% Subtotal Contract Cost 10% 10% Nourishment 20% 20% Total Construction Cost Summary-Investment and Annual Costs Item Item	\$1,000,000 \$9.00 \$9.00 \$300 \$300,000 15% 10%	1 503,965 269,962 0.5 4.0	\$1,000,000 \$4,535,685 \$1,214,668 \$6,750,499 \$1,012,575 \$7,763,074 \$7,763,074 \$776,307	\$1,000,000 \$2,429,660 \$145 \$3,429,806 \$514,471 \$3,944,276 \$788,855
Cost	\$9.00 \$9.00 \$300,000 15% 10%	503,965 269,962 0.5 4.0	\$4,535,685 \$145 \$1,214,668 \$6,750,499 \$1,012,575 \$7,763,074 \$7,763,074 \$776,307	\$2,429,660 \$145 \$3,429,806 \$514,471 \$3,944,276 \$788,855
Cost	\$9.00 \$300 \$300,000 15% 10%	269,962 0.5 4.0	\$145 \$1,214,668 \$6,750,499 \$1,012,575 \$7,763,074 \$776,307 \$8,539,381	\$2,429,660 \$145 \$3,429,806 \$514,471 \$3,944,276 \$788,855
Cost	\$300,000 \$300,000 15% 10% 20%	1 1 1	\$145 \$1,214,668 \$6,750,499 \$1,012,575 \$7,763,074 \$776,307 \$776,307	\$145 \$3,429,806 \$514,471 \$3,944,276 \$788,855
Cost	\$300,000 15% 10% 20%	0.4	\$1,214,668 \$6,750,499 \$1,012,575 \$7,763,074 \$776,307 \$776,307	\$3,429,806 \$514,471 \$3,944,276 \$788,855
Cost	15% 10% 20%		\$6,750,499 \$1,012,575 \$7,763,074 \$776,307 \$8,539,381	\$3,429,806 \$514,471 \$3,944,276 \$788,855
Contract Cost struction Cost	15% 10% 20%		\$1,012,575 \$7,763,074 \$776,307 \$8,539,381	\$3,944,276 \$3,944,276 \$788,855
Contract Cost struction Cost	10%		\$7,763,074 \$776,307 \$8,539,381	\$3,944,276 \$788,855 \$4 733 132
struction Cost	10%		\$776,307	\$788,855
struction Cost	20%		\$8,539,381	\$788,855
struction Cost	20%	-	\$8,539,381	\$788,855
I Construction Cost			\$8,539,381	\$4 733 132
				12.(22.1.1)
Item	tment and Annual (Sosts		
			Renourishment at Indicated Year	at Indicated Year
			2002	2014
Construction Cost			\$8,539,381	\$4,733,132
Interest During Construction			\$42,619	\$0
Total Investment Cost			\$8,582,000	\$4,733,132
Present Worth of Each Construction			\$8,582,000	\$2,319,189
Total Present Worth			\$10,901,189	11,189

Average Annual Cost Interest Rate	\$1,016,267	6.125%	
arage Annual Cost grest Rate			
	erage Annual Cost	rest Rate	

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Estimate of Contract and Construction Costs
Ft Lauderdale
1' Added Shoreline Width (ft) to R-74
Renourishment Interval: 13 yrs
Project Life: 18 years

ltem	Project Year	Unit Cost	Quantity	Renourishment at Indicated Year 2002	at Indicated Year 2015
Mobilization		\$1,000,000	_	\$1,000,000	\$1,000,000
Reach 3 Beach Fill (cy)	0	\$9.00	522,852	\$4,705,671	
	13	\$9.00	251,075		\$2,259,674
Beach Tilling (ac)		\$300	0.5	\$145	\$145
Hard Bottom Mitigation (ac)		\$300,000	4.1	\$1,240,397	
Subtotal				\$6,946,214	\$3,259,819
Contingency		15%		\$1,041,932	\$488,973
Subtotal Contract Cost				\$7,988,146	\$3,748,792
Nourishment					
E&D+S&A		10%	~	\$798,815	
1st Renourishment		%02	₹		\$749 758
Total Construction Cost				\$8,786,960	\$4,498,551
	Summary-Invest	Summary-Investment and Annual Costs	Costs		
ltem				Renourishment at Indicated Year	at Indicated Year
Construction Cost				\$8,786,960	\$4,498,551
Interest During Construction				\$43,855	\$0
Total Investment Cost				\$8,830,815	\$4,498,551
Present Worth of Each Construction				\$8,830,815	\$2,077,029
Total Present Worth				\$10,907,844	17,844

Average Annual Cost	\$1,016,888
Interest Rate	6.125%

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Estimate of Contract and Construction Costs
Ft Lauderdale
20' Added Shoreline Width (ft) to R-74
Renourishment Interval: 11 yrs
Project Life: 18 years

ltem	Project Year	Unit Cost	Quantity	Renourishment at Indicated Year 2002	at Indicated Year 2013
Mobilization		\$1,000,000	•	\$1,000,000	\$1,000,000
Reach 3 Beach Fill (cy)	o :	\$9.00	830,009	\$7,470,081	0
	11	\$9.00	288,850	-	\$2,599,646
Beach Tilling (ac)		\$300	6.7	\$2,908	\$2,908
Hard Bottom Mitigation (ac)		\$300,000	5.9	\$1,768,281	
Subtotal				\$10,241,270	\$3,602,554
Contingency		15%		\$1,536,190	\$540,383
Subtotal Contract Cost				\$11,777,460	\$4,142,938
Nourishment					
E&D+S&A		10%	_	\$1,177,746	
1st Renourishment					
E&D+S&A		20%	-	-	\$828,588
Total Construction Cost				\$12,955,206	\$4,971,525
	Summary-Invest	Summary-Investment and Annual Costs	Costs	•	
Item				Renourishment at Indicated Year	at Indicated Year
Construction Cost				\$12,955,206	\$4,971,525
Interest During Construction				\$64,979	\$0
Total Investment Cost				\$13,020,186	\$4,971,525
Present Worth of Each Construction				\$13,020,186	\$2,585,205
Total Present Worth				\$15,605,390	05,390

Average Annual Cost	\$1,454,818
Interest Rate	6.125%

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Estimate of Contract and Construction Costs
Ft Lauderdale
20' Added Shoreline Width (ft) to R-74
Renourishment Interval: 12 yrs
Project Life: 18 years

m)	Drojoot Voor	Init Cost	Ousneithy	Renourishment at Indicated Year	at Indicated Year
	רוטומטו ו במו	OIII COSI	«dalluty	2002	2014
Mobilization		\$1,000,000	~	\$1,000,000	\$1,000,000
Reach 3 Beach Fill (cy)	0	\$9.00	348,896	\$7,640,067	
	12	\$9.00	269,962		\$2,429,660
Beach Tilling (ac)		\$300	9.7	\$2,908	\$2,908
Hard Bottom Mitigation (ac)		\$300,000	6.0	\$1,805,256	
Subtotal				\$10,448,230	\$3,432,568
Contingency		15%		\$1,567,235	\$514,885
Subtotal Contract Cost				\$12,015,465	\$3,947,454
Nourishment					
E&D+S&A		10%	~	\$1,201,547	
1st Renourishment					
E&D+S&A		20%	1		\$789,491
Total Construction Cost				\$13,217,012	\$4,736,944
	Summary-Invest	Summary-Investment and Annual Costs	Costs		
-				Renourishment at Indicated Year	at Indicated Year
Item				2002	2014
Construction Cost				\$13,217,012	\$4,736,944
Interest During Construction				\$66,293	\$0
Total Investment Cost				\$13,283,304	\$4,736,944
Present Worth of Each Construction				\$13,283,304	\$2,321,057
Total Present Worth				\$15,604,361	14,361
			2000		

Average Annual Cost	\$1,454,722
Interest Rate	6.125%

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Estimate of Contract and Construction Costs
Ft Lauderdale
20' Added Shoreline Width (ft) to R-74
Renourishment Interval: 13 yrs
Project Life: 18 years

ltem	Project Year	Unit Cost	Quantity	Renourishment at Indicated Year 2002	it Indicated Year 2015
Mobilization		\$1,000,000	-	\$1,000,000	\$1,000,000
Reach 3 Beach Fill (cy)	0	\$9.00	867,784	\$7,810,053	
	13	\$9.00	251,075		\$2,259,674
Beach Tilling (ac)		\$300	9.7	\$2,908	\$2,908
Hard Bottom Mitigation (ac)		\$300,000	6.1	\$1,842,230	
Subtotal				\$10,655,191	\$3,262,582
Contingency		15%		\$1,598,279	\$489,387
Subtotal Contract Cost				\$12,253,470	\$3,751,970
Nourishment					
E&D+S&A		10%	~	\$1,225,347	
1st Renourishment		Č	,		() () () () () () () () () ()
E&D+S&A		70%	-		\$750,394
Total Construction Cost				\$13,478,817	\$4,502,363
	Summary-Invest	Summary-Investment and Annual Costs	Costs		
ltem				Renourishment at Indicated Year	t Indicated Year
				2002	2015
Construction Cost				\$13,478,817	\$4,502,363
Interest During Construction				\$67,606	80
Total Investment Cost				\$13,546,422	\$4,502,363
Present Worth of Each Construction				\$13,546,422	\$2,078,789
Total Present Worth				\$15,625,211	5,211

Average Annual Cost	\$1,456,666
Interest Rate	6.125%

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Estimate of Contract and Construction Costs
Ft Lauderdale
25' Added Shoreline Width (ft) to R-74
Renourishment Interval: 10 yrs
Project Life: 18 years

ltem	Project Year	Unit Cost	Quantity	Renourishment at Indicated Year 2002	It Indicated Year 2012
Mobilization		\$1,000,000	_	\$1,000,000	\$1,000,000
Reach 3 Beach Fill (cy)	0	\$9.00	901,893	\$8,117,037	
	10	\$9.00	307,737		\$2,769,633
Beach Tilling (ac)		\$300	12.1	\$3,635	\$3,635
Hard Bottom Mitigation (ac)		\$300,000	6.4	\$1,909,409	
Subtotal				\$11,030,081	\$3,773,268
Contingency		15%		\$1,654,512	\$565,990
Subtotal Contract Cost				\$12,684,593	\$4,339,258
Nourishment					
E&D+S&A		10%	_	\$1,268,459	
1st Renourishment		%U6	t		4867882
Total Construction Cost				\$13,953,053	\$5,207,109
	Summary-Invest	Summary-Investment and Annual Costs	Costs		
ltem				Renourishment at Indicated Year 2002	it Indicated Year 2012
Construction Cost				\$13,953,053	\$5,207,109
Interest During Construction				\$70,332	0\$
Total Investment Cost				\$14,023,384	\$5,207,109
Present Worth of Each Construction				\$14,023,384	\$2,873,556
Total Present Worth				\$16,896,940	16,940

_	Average Annual Cost	\$1,575,223
_	Interest Rate	6.125%
1		

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Estimate of Contract and Construction Costs
Ft Lauderdale
25' Added Shoreline Width (ft) to R-74
Renourishment Interval: 11 yrs
Project Life: 18 years

ltem	Project Year	Unit Cost	Quantity	Renourishment a 2002	Renourishment at Indicated Year 2002
Mobilization		\$1,000,000	-	\$1,000,000	\$1,000,000
Reach 3 Beach Fill (cy)	0	\$9.00	920,780	\$8,287,023	
	_	\$9.00	288,850		\$2,599,646
Beach Tilling (ac)		\$300	12.1	\$3,635	\$3,635
Hard Bottom Mitigation (ac)		\$300,000	6.5	\$1,953,293	
Subtotal				\$11,243,951	\$3,603,282
Contingency		15%		\$1,686,593	\$540,492
Subtotal Contract Cost				\$12,930,544	\$4,143,774
Nourishment					
E&D+S&A		10%	_	\$1,293,054	
1st Renourishment					
E&D+S&A		20%	_		\$828,755
Total Construction Cost				\$14,223,598	\$4,972,528
	Summary-Invest	Summary-Investment and Annual Costs	Costs		
mell				Renourishment a	Renourishment at Indicated Year
				2002	2013
Construction Cost				\$14,223,598	\$4,972,528
Interest During Construction				\$71,696	0\$
Total Investment Cost				\$14,295,294	\$4,972,528
Present Worth of Each Construction				\$14,295,294	\$2,585,726
Total Present Worth				\$16,88	\$16,881,020

6.125%	Interest Rate
\$1,573,739	Average Annual Cost

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Estimate of Contract and Construction Costs
Ft Lauderdale
25' Added Shoreline Width (ft) to R-74
Renourishment Interval: 12 yrs
Project Life: 18 years

			2		
Mobilization Reach 3 Beach Fill (cy) Beach Tilling (ac)			حصصانيين	2002	2014
Reach 3 Beach Fill (cy) Beach Tilling (ac)		\$1,000,000	1	\$1,000,000	\$1,000,000
Beach Tilling (ac)	0	\$9.00	939,668	\$8,457,009	
Beach Tilling (ac)	12	\$9.00	269,962		\$2,429,660
		\$300	12.1	\$3,635	\$3,635
Hard Bottom Mitigation (ac)		\$300,000	6.7	\$1,997,177	
Subtotal				\$11,457,821	\$3,433,295
Contingency		15%		\$1,718,673	\$514,994
Subtotal Contract Cost				\$13,176,494	\$3,948,290
Nourishment					
E&D+S&A		10%	₹~	\$1,317,649	
1st Renourishment		ò	•		000
E&D+S&A		20%	_		\$789,658
Total Construction Cost				\$14,494,144	\$4,737,948
Ø	Summary-Investr	Summary-Investment and Annual Costs	Costs		
ltem				Renourishment at Indicated Year 2002	t Indicated Year
Construction Cost				\$14,494,144	\$4,737,948
Interest During Construction				\$73,059	\$0
Total Investment Cost				\$14,567,203	\$4,737,948
Present Worth of Each Construction				\$14,567,203	\$2,321,549
Total Present Worth				\$16,888,752	18,752

Average Annual Cost	\$1,574,460
Interest Rate	6.125%

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Estimate of Contract and Construction Costs

Ft Lauderdale
50' Added Shoreline Width (ft) to R-74
Renourishment Interval: 9 yrs
Project Life: 18 years

ltem	Project Year	Unit Cost	Quantity	Renourishment at Indicated Year 2002	t Indicated Year 2011
Mobilization		\$1,000,000	1	\$1,000,000	\$1,000,000
Reach 3 Beach Fill (cy)	0	\$9.00	1,336,863	\$12,031,763	
	თ	\$9.00	326,624		\$2,939,619
Beach Tilling (ac)		\$300	24.2	\$7,270	\$7,270
Hard Bottom Mitigation (ac)		\$300,000	10.1	\$3,035,705	
Subtotal				\$16,074,738	\$3,946,889
Contingency		15%		\$2,411,211	\$592,033
Subtotal Contract Cost				\$18,485,949	\$4,538,922
Nourishment					
E&D+S&A		10%	ν-	\$1,848,595	
1st Renourishment					
E&D+S&A		20%	1		\$907,784
Total Construction Cost				\$20,334,544	\$5,446,707
	Summary-Invest	Summary-Investment and Annual Costs	Costs		
Item				Renourishment at Indicated Year	t Indicated Year
				2002	2011
Construction Cost				\$20,334,544	\$5,446,707
Interest During Construction				\$103,007	\$0
Total Investment Cost				\$20,437,551	\$5,446,707
Present Worth of Each Construction				\$20,437,551	\$3,189,882
Total Present Worth				\$23,627,434	7,434

Average Annual Cost	\$2,202,676
Interest Rate	6.125%

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Estimate of Contract and Construction Costs
Ft Lauderdale
50' Added Shoreline Width (ft) to R-74
Renourishment Interval: 10 yrs
Project Life: 18 years

ltem	Project Year	Unit Cost	Quantity	Renourishment at Indicated Year 2002	it Indicated Year 2012
Mobilization		\$1,000,000	1		\$1,000,000
Reach 3 Beach Fill (cy)	0	\$9.00	1,355,750	\$12,201,749	
	10	\$9.00	307,737		\$2,769,633
Beach Tilling (ac)		\$300	24.2	\$7,270	\$7,270
Hard Bottom Mitigation (ac)		\$300,000	10.4	\$3,105,557	
Subtotal				\$16,314,576	\$3,776,903
Contingency		15%		\$2,447,186	\$566,535
Subtotal Contract Cost				\$18,761,763	\$4,343,438
Nourishment					
E&D+S&A		10%	Τ	\$1,876,176	
1st Renourishment					*
E&D+S&A		20%	-		\$868,688
Total Construction Cost				\$20,637,939	\$5,212,126
	Summary-Invest	Summary-Investment and Annual Costs	Costs		
mv4				Renourishment at Indicated Year	t Indicated Year
				2002	2012
Construction Cost				\$20,637,939	\$5,212,126
Interest During Construction				\$104,544	0\$
Total Investment Cost				\$20,742,483	\$5,212,126
Present Worth of Each Construction	-			\$20,742,483	\$2,876,324
Total Present Worth				\$23,618,808	8,808

Average Annual Cost	\$2,201,872
Interest Rate	6.125%

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Estimate of Contract and Construction Costs
Ft Lauderdale
50' Added Shoreline Width (ft) to R-74
Renourishment Interval: 11 yrs
Project Life: 18 years

Item	Project Year	Unit Cost	Quantity	Renourishment at Indicated Year 2002	at Indicated Year 2013
Mobilization		\$1,000,000	_	\$1,000,000	\$1,000,000
Reach 3 Beach Fill (cy)	0	\$9.00	1,374,637	\$12,371,736	
	1	\$9.00	288,850		\$2,599,646
Beach Tilling (ac)		\$300	24.2	\$7,270	\$7,270
Hard Bottom Mitigation (ac)		\$300,000	10.6	\$3,181,335	
Subtotal				\$16,560,341	\$3,606,917
Contingency		15%		\$2,484,051	\$541,038
Subtotal Contract Cost				\$19,044,392	\$4,147,954
Nourishment					
E&D+S&A		10%	_	\$1,904,439	
1st Renourishment					
E&D+S&A		20%	-		\$829,591
Total Construction Cost				\$20,948,831	\$4,977,545
	Summary-Invest	Summary-Investment and Annual Costs	Costs		
The state of the s		:		Renourishment at Indicated Year	at Indicated Year
				2002	2013
Construction Cost				\$20,948,831	\$4,977,545
Interest During Construction				\$106,119	0\$
Total Investment Cost				\$21,054,951	\$4,977,545
Present Worth of Each Construction		-	•	\$21,054,951	\$2,588,335
Total Present Worth				\$23,643,285	13,285

ı		
. ol	6.125%	Interest Rate
₹1	\$2,204,154	Average Annual Cost

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SUB-APPENDIX A-4

DETAILED COST ESTIMATES FOR EVALUATION OF THE PROJECT LENGTH OF THE MODIFICATION TO THE FEDERAL PROJECT

Sub-Apendix A-4

Modification to the Federal Project Project Length Summary

Baseline Extension	South Project	Nourishment	Annualized
(ft)	Limit	Interval (yrs)	Costs
25	R-74	10	\$1,575,000
25	R-74	11	\$1,574,000
25	R-74	12	\$1,574,000
25	R-79	11	\$2,038,000
25	R-79	12	\$2,037,000
25	R-79	13	\$2,039,000
25	R-84	11	\$2,232,000
25	R-84	12	\$2,231,000
25	R-84	13	\$2,231,000

Estimate of Contract and Construction Costs

Ft Lauderdale
25' Added Shoreline Width (ft) to R-74
Renourishment Interval: 10 yrs
Project Life: 18 years

ltem	Project Year	Unit Cost	Quantity	Renourishment at Indicated Year 2002	at Indicated Year 2012
Mobilization		\$1,000,000	-	\$1,000,000	\$1,000,000
Reach 3 Beach Fill (cy)	0	\$9.00	901,893	\$8,117,037	
	10	\$9.00	307,737		\$2,769,633
Beach Tilling (ac)		\$300	12.1	\$3,635	\$3,635
Hard Bottom Mitigation (ac)		\$300,000	6.4	\$1,909,409	
Subtotal				\$11,030,081	\$3,773,268
Contingency		15%		\$1,654,512	\$565,990
Subtotal Contract Cost				\$12,684,593	\$4,339,258
Nourishment					
E&D+S&A		10%		\$1,268,459	
1st Renourishment					-
E&D+S&A		20%	_		\$867,852
Total Construction Cost				\$13,953,053	\$5,207,109
	Summary-Invest	Summary-Investment and Annual Costs	Costs		
Item				Renourishment at Indicated Year	t Indicated Year
Construction Cost				413 953 053	\$5 207 109
Interest During Construction				\$70,332	80 \$
		\$			
Total Investment Cost				\$14,023,384	\$5,207,109
Present Worth of Each Construction				\$14,023,384	\$2,873,556
Total Present Worth				\$16,896,940	16,940

Average Annual Cost	\$1,575,223
Interest Rate	6.125%

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Estimate of Contract and Construction Costs

Ft Lauderdale
25' Added Shoreline Width (ft) to R-74
Renourishment Interval: 11 yrs
Project Life: 18 years

Mobilization \$1,000,000 1 \$ Reach 3 Beach Fill (cy) 0 \$9.00 320,780 \$ Beach Tilling (ac) \$300 12.1 \$ Hard Bottom Mitigation (ac) \$300,000 6.5 \$ Hard Bottom Mitigation (ac) \$300,000 6.5 \$ Contingency \$300,000 6.5 \$ Subtotal 15% \$ \$ Nourishment E&D+S&A 1 \$ 1 st Renourishment E&D+S&A 1 \$ Total Construction Cost Total Construction Cost \$ Interest During Construction Summary-Investment and Annual Costs \$ Total Investment Cost Total Investment Cost \$ Total Investment Worth of Each Construction \$	ltem	Project Year	Unit Cost	Quantity	Renourishment at Indicated Year 2002	at Indicated Year 2013
(cy) 0 \$9.00 920,780 11 \$9.00 288,850 \$300 (ac) \$300,000 6.5 tion (a	Mobilization		\$1,000,000	-	\$1,000,000	\$1,000,000
tion (ac) \$300 288,850 \$300 12.1 \$300,000 6.5 lbtotal 15%		0	\$9.00	920,780	\$8,287,023	
\$300 12.1 \$300,000 6.5 Ibtotal 15% Contract Cost struction Cost Summary-Investment and Annual Costs tem struction struction struction struction struction		1	\$9.00	288,850		\$2,599,646
tion (ac) \$300,000 6.5 Intotal 15% Contract Cost Summary-Investment and Annual Costs term Summary-Investment and Annual Costs struction struction sach Construction	Beach Tilling (ac)		\$300	12.1	\$3,635	\$3,635
Summary-Investment and Annual Costs struction struction sach Construction 15% 10% 1 20% 20%	Hard Bottom Mitigation (ac)		\$300,000	6.5	\$1,953,293	
Sontract Cost 10% 1 20% 1 struction Cost Summary-Investment and Annual Costs tem struction struction struction set	Subtotal				\$11,243,951	\$3,603,282
Sontract Cost 10% 1 struction Cost Summary-Investment and Annual Costs tem struction struction set	Contingency		15%		\$1,686,593	\$540,492
struction Cost Summary-Investment and Annual Costs tem struction sach Construction	ototal				\$12,930,544	\$4,143,774
struction Summary-Investment and Annual Costs tem struction sach Construction	Nourishment					
struction Cost Summary-Investment and Annual Costs tem struction sach Construction	E&D+S&A		10%	~	\$1,293,054	
struction Cost Summary-Investment and Annual Costs tem struction sach Construction	1st Renourishment		ò	•		1 1 0 0
Summary-Investment and Annual Costs	E&D+V&A		Z0%	_		\$020,733
Summary-Investment and Annual Costs	Total Construction Cost				\$14,223,598	\$4,972,528
		Summary-Invest	nent and Annual	Costs		
	Item				Renourishment at Indicated Year	at Indicated Year
	+ 0 0 0 10 11 11 11 11 11 11 11 11 11 11				411 222 500	\$4 070 F28
	Construction Cost Interest During Construction				\$71,696	\$4,912,320
	Total Investment Cost				\$14,295,294	\$4,972,528
	Present Worth of Each Construction				\$14,295,294	\$2,585,726
Total Present Worth	Total Present Worth				\$16,881,020	31,020

Average Annual Cost	\$1,573,739
Interest Rate	6.125%

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Estimate of Contract and Construction Costs

Ft Lauderdale
25' Added Shoreline Width (ft) to R-74

Renourishment Interval: 12 yrs

Project Life: 18 years

ltem	Project Year	Unit Cost	Quantity	Renourishment at Indicated Year 2002	at Indicated Year 2014
Mobilization		\$1,000,000	_	\$1,000,000	\$1,000,000
Reach 3 Beach Fill (cy)	0	\$9.00	939,668	\$8,457,009	
	12	\$9.00	269,962		\$2,429,660
Beach Tilling (ac)		\$300	12.1	\$3,635	\$3,635
Hard Bottom Mitigation (ac)		\$300,000	6.7	\$1,997,177	
Subtotal				\$11,457,821	\$3,433,295
Contingency		15%		\$1,718,673	\$514,994
Subtotal Contract Cost				\$13,176,494	\$3,948,290
Nourishment					
E&D+S&A		10%	_	\$1,317,649	
1st Renourishment					·
E&D+S&A		20%	_	÷	\$789,658
Total Construction Cost				\$14,494,144	\$4,737,948
	Summary-Invest	Summary-Investment and Annual Costs	Costs		
Item				Renourishment at Indicated Year	at Indicated Year
				2002	2014
Construction Cost				\$14,494,144	\$4,737,948
Interest During Construction				\$73,059	\$0
Total Investment Cost				\$14,567,203	\$4,737,948
Present Worth of Each Construction				\$14,567,203	\$2,321,549
Total Present Worth	-			\$16,888,752	88,752

\$1,574,460	6.125%	
Average Annual Cost	Interest Rate	

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Estimate of Contract and Construction Costs Ft Lauderdale 25' Added Shoreline Width (ft) to R-79 Renourishment Interval: 11 yrs Project Life: 18 years

ltem	Project Year	Unit Cost	Quantity	Renourishment at Indicated Year 2002	at Indicated Year 2013
Mobilization Reach 3 Beach Fill (cy)	0	\$1,000,000 \$9.00	1,074,451	\$1,000,000 \$9,670,062	\$1,000,000
	1	\$9.00	328,330		\$2,954,968
Beach Tilling (ac)		\$300	15.2	\$4,558	\$4,558
Hard Bottom Mitigation (ac)		\$300,000	14.3	\$4,284,178	
Subtotal				\$14,958,798	\$3,959,527
Contingency		15%		\$2,243,820	\$593,929
Subtotal Contract Cost				\$17,202,618	\$4,553,456
Nourishment					
E&D+S&A		10%	←	\$1,720,262	
1st Renourishment					
E&D+S&A		20%	_		\$910,691
Total Construction Cost				\$18,922,880	\$5,464,147
	Summary-Investment and Annual Costs	nent and Annual	Costs		
Item				Renourishment at Indicated Year	ut Indicated Year
				2002	2013
Construction Cost				\$18,922,880	\$5,464,147
Interest During Construction				\$95,383	\$0
Total Investment Cost				\$19,018,262	\$5,464,147
Present Worth of Each Construction				\$19,018,262	\$2,841,369
Total Present Worth				\$21,859,631	9,631

Average Annual Cost	\$2,037,872
Interest Rate	6.125%

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Estimate of Contract and Construction Costs
Ft Lauderdale
25' Added Shoreline Width (ft) to R-79
Renounishment Interval: 12 yrs
Project Life: 18 years

ltem	Project Year	Unit Cost	Quantity	Renourishment at Indicated Year 2002	at Indicated Year 2014
Mobilization		\$1,000,000	-	\$1,000,000	\$1,000,000
Reach 3 Beach Fill (cy)	0	\$9.00	1,093,339	\$9,840,048	
	12	\$9.00	309,442		\$2,784,982
Beach Tilling (ac)		\$300	15.2	\$4,558	\$4,558
Hard Bottom Mitigation (ac)		\$300,000	14.4	\$4,328,062	
Subtotal				\$15,172,668	\$3,789,540
Contingency		15%		\$2,275,900	\$568,431
Subtotal Contract Cost				\$17,448,568	\$4,357,972
Nourishment		10%	₹-	\$1 744.857	
1st Renourishment) 			
E&D+S&A		20%	-		\$871,594
Total Construction Cost				\$19,193,425	\$5,229,566
	Summary-Invest	Summary-Investment and Annual Costs	Costs		
ltem				Renourishment at Indicated Year 2002	at Indicated Year 2014
Construction Cost				\$19,193,425	\$5,229,566
Interest During Construction				\$96,746	\$0
Total Investment Cost				\$19,290,172	\$5,229,566
Present Worth of Each Construction				\$19,290,172	\$2,562,437
Total Present Worth		:		\$21,852,609	52,609

Interest Rate 6.125%	Average Annual Cost	\$2,037,217
	Interest Rate	6.125%

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Estimate of Contract and Construction Costs

Ft Lauderdale
25' Added Shoreline Width (ft) to R-79
Renourishment Interval: 13 yrs
Project Life: 18 years

ltem	Project Year	Unit Cost	Quantity	Renourishment at Indicated Year 2002 2015	at Indicated Year 2015
Mobilization		\$1,000,000	-	\$1,000,000	\$1,000,000
Reach 3 Beach Fill (cy)	0	\$9.00	1,112,226	\$10,010,034	
	13	\$9.00	290,555		\$2,614,996
Beach Tilling (ac)		\$300	15.2	\$4,558	\$4,558
Hard Bottom Mitigation (ac)		\$300,000	14.6	\$4,371,946	
Subtotal				\$15,386,538	\$3,619,554
Contingency		15%		\$2,307,981	\$542,933
Subtotal Contract Cost				\$17,694,519	\$4,162,487
Nourishmen					
E&D+S&A		10%	-	\$1,769,452	
1st Renourishment					
E&D+S&A		20%	7		\$832,497
Total Construction Cost				\$19,463,971	\$4,994,985
	Summary-Invest	Summary-Investment and Annual Costs	Costs		
ltem				Renourishment at Indicated Year	at Indicated Year
Construction Cost				\$19,463,971	\$4,994,985
Interest During Construction				\$98,110	\$0
Total Investment Cost				\$19,562,081	\$4,994,985
Present Worth of Each Construction				\$19,562,081	\$2,306,238
Total Present Worth				\$21,868,318	18,318

Average Annual Cost	\$2,038,682
Interest Rate	6.125%

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Estimate of Contract and Construction Costs Ft Lauderdale 25' Added Shoreline Width (ft) to R-84 Renourishment Interval: 11 yrs Project Life: 18 years

Item	Project Year	Unit Cost	Quantity	Renourishment at Indicated Year 2002	t Indicated Year 2013
Mobilization		\$1,000,000	-	\$1,000,000	\$1,000,000
Reach 3 Beach Fill (cy)	0	\$9.00	1,207,079	\$10,863,707	
	-	\$9.00	362,570		\$3,263,132
Beach Tilling (ac)		\$300	17.8	\$5,350	\$5,350
Hard Bottom Mitigation (ac)		\$300,000	15.2	\$4,556,664	
Subtotal				\$16,425,721	\$4,268,483
Contingency		15%		\$2,463,858	\$640,272
Subtotal Contract Cost				\$18,889,579	\$4,908,755
Nourishment					
E&D+S&A		10%	~	\$1,888,958	
1st Renourishment					
E&D+S&A		20%	7		\$981,751
Total Construction Cost				\$20,778,537	\$5,890,506
	Summary-Investment and Annual Costs	nent and Annual	Costs		:
Item				Renourishment at Indicated Year	t Indicated Year
Construction Cost				\$20.778.537	\$5.890.506
Interest During Construction				\$105,257	0\$
Total Investment Cost				\$20,883,794	\$5,890,506
Present Worth of Each Construction				\$20,883,794	\$3,063,077
Total Present Worth				\$23,946,871	6,871

Average Annual Cost	NΪ
Interest Rate	6.125%

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Estimate of Contract and Construction Costs
Ft Lauderdale
25' Added Shoreline Width (ft) to R-84
Renourishment Interval: 12 yrs
Project Life: 18 years

ltem	Project Year	Unit Cost	Quantity	Renourishment at Indicated Year 2002	it Indicated Year 2014
Mobilization		\$1,000,000	-	\$1,000,000	\$1,000,000
Reach 3 Beach Fill (cy)	0	\$9.00	1,226,019	\$11,034,170	
	12	\$9.00	343,630	-	\$3,092,670
Beach Tilling (ac)		\$300	17.8	\$5,350	\$5,350
Hard Bottom Mitigation (ac)		\$300,000	15.3	\$4,600,548	
Subtotal				\$16,640,068	\$4,098,020
Contingency		15%		\$2,496,010	\$614,703
Subtotal Contract Cost				\$19,136,078	\$4,712,723
Nourishment					
E&D+S&A		10%	~	\$1,913,608	
1st Renourishment					
E&D+S&A		20%	_	- 1.	\$942,545
Total Construction Cost				\$21,049,686	\$5,655,267
	Summary-Invest	Summary-Investment and Annual Costs	Costs		
ltem				Renourishment at Indicated Year 2002	it Indicated Year 2014
Construction Cost				\$21,049,686	\$5,655,267
Interest During Construction				\$106,630	\$0
Total Investment Cost				\$21,156,316	\$5,655,267
Present Worth of Each Construction				\$21,156,316	\$2,771,027
Total Present Worth				\$23,927,343	7,343

\$2,230,635	6.125%	
Average Annual Cost	Interest Rate	

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Estimate of Contract and Construction Costs Ft Lauderdale 25' Added Shoreline Width (ft) to R-84 Renounishment Interval: 13 yrs Project Life: 18 years

ltem	Project Year	Unit Cost	Quantity	Renourishment a 2002	Renourishment at Indicated Year 2002
Mobilization		\$1,000,000	-	\$1,000,000	\$1,000,000
Reach 3 Beach Fill (cy)	0	\$9.00	1,244,959	\$11,204,633	
	13	\$9.00	324,690		\$2,922,207
Beach Tilling (ac)		\$300	17.8	\$5,350	\$5,350
Hard Bottom Mitigation (ac)		\$300,000	15.5	\$4,644,432	
Subtotal				\$16,854,415	\$3,927,557
Contingency		15%		\$2,528,162	\$589,134
Subtotal Contract Cost				\$19,382,577	\$4,516,690
Nourishment					
E&D+S&A		10%	~	\$1,938,258	
1st Renourishment					
E&D+S&A		20%	-		\$903,338
Total Construction Cost				\$21,320,835	\$5,420,029
	Summary-Invest	Summary-Investment and Annual Costs	Costs		
Item				Renourishment a	Renourishment at Indicated Year
Construction Cost				\$21,320,835	\$5,420,029
Interest During Construction				\$108,004	\$0
Total Investment Cost				\$21,428,838	\$5,420,029
Present Worth of Each Construction				\$21,428,838	\$2,502,485
Total Present Worth				\$23,93	\$23,931,323

6.125%	Interest Rate
\$2,231,006	Average Annual Cost

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SUB-APPENDIX A-5

DETAILED COST ESTIMATES
USED FOR DETERMINING THE OPTIMAL RENOURISHMENT INTERVAL
OF THE IMPLEMENTATION OF THE FEDERAL PROJECT

Sub-Apendix A-5

Implementation of the Reevaluated Federal Project Interval Optimization Summary

Segment II Pompano Beach to Fort Lauderdale

Nourishment Interval (years)	Project Costs
9	\$2,356,000
10	\$2,355,000
11	\$2,358,000
12	\$2,364,000
13	\$2,373,000
14	\$2,385,000
15	\$2,400,000

Estimate of Contract and Construction Costs Segment II 100'/25' Added Shoreline Width (ft) Renourishment Interval: 9 yrs Project Life: 18 yrs

ltem	Project Year	Unit Cost	Quantity	Renourishment a	Renourishment at Indicated Year 2002
Mobilization		\$1,100,000	1	\$1,100,000	\$1,100,000
Reach 2 Beach Fill (cy)	0	\$8.50	342,840	\$2,914,143	
	6	\$8.50	225,703		\$1,918,477
Reach 3 Beach Fill (cy)	0	\$9.00	883,006	\$7,947,051	
	σ	\$9.00	326,624		\$2,939,619
Beach Tilling (ac)		\$300	29.9	\$8,966	996'8\$
Hard Bottom Mitigation (ac)		\$300,000	12.4	\$3,713,277	
Subtotal				\$15,683,437	\$5,967,062
Contingency		15%		\$2,352,516	\$895,059
Subtotal Contract Cost				\$18,035,953	\$6,862,121
Geotechnical Investigations		190,000		\$190,000	\$190,000
Secure Easements		250,000	_	\$250,000	
Environmental Monitoring		275,079	_	\$275,079	\$275,079
E&D+S&A		1,342,000	-	\$1,342,000	\$1,342,000
Total Construction Cost				\$20,093,032	\$8,669,200
	Summary-Inves	Summary-Investment and Annual Costs	Costs		
ltem				Renourishment a 2002	Renourishment at Indicated Year 2002
Construction Cost Interest During Construction				\$20,093,032 \$101,784	\$8,669,200 \$0
Total Investment Cost				\$20,194,816	\$8,669,200
Present Worth of Each Construction				\$20,194,816	\$5,077,146
Total Present Worth				\$25,271,962	71,962

	Average Annual Cost	\$2,355,988
	Interest Rate	6.125%
•		

Estimate of Contract and Construction Costs
Segment II
100/25' Added Shoreline Width (ft)
Renourishment Interval: 10 yrs
Project Life: 18 yrs

ltem	Project Year	Unit Cost	Quantity	Renourishment 2002	Renourishment at Indicated Year 2002 2012
Mobilization		\$1,100,000		\$1,100,000	\$1,100,000
Reach 2 Beach Fill (cy)	0	\$8.50	356,088	\$3,026,746	
	9	\$8.50	212,456		\$1,805,873
Reach 3 Beach Fill (cy)	0	\$9.00	901,893	\$8,117,037	-
	10	\$9.00	307,737		\$2,769,633
Beach Tilling (ac)		\$300	29.9	\$8,966	\$8,966
Hard Bottom Mitigation (ac)		\$300,000	12.8	\$3,829,062	
Subtotal				\$16,081,811	\$5,684,472
Contingency		15%		\$2,412,272	\$852,671
Subtotal Contract Cost				\$18,494,083	\$6,537,143
Geotechnical Investigations		190,000	<u></u>	\$190,000	\$190,000
Secure Easements		250,000	_	\$250,000	
Environmental Monitoring		275,079	_	\$275,079	\$275,079
E&D+S&A		1,342,000	-	\$1,342,000	\$1,342,000
Total Construction Cost				\$20,551,162	\$8,344,222
	Summary-Inves	Summary-Investment and Annual Costs	al Costs		
lfem				Renourishment	Renourishment at Indicated Year
				2002	2012
Construction Cost				\$20,551,162	\$8,344,222
Interest During Construction				\$104,105	\$0
Total Investment Cost				\$20,655,267	\$8,344,222
Present Worth of Each Construction				\$20,655,267	\$4,604,779
Total Present Worth				\$25,26	\$25,260,046

Interest Rate 6.125%	Average Annual Cost	\$2,354,877
		6.125%

Estimate of Contract and Construction Costs Segment II 100/25' Added Shoreline Width (ft) Renourishment Interval: 11 yrs Project Life: 18 yrs

ltem	Project Year	Unit Cost	Quantity	Renourishment a 2002	Renourishment at Indicated Year 2002
Mobilization		\$1,100,000	-	\$1,100,000	\$1,100,000
Reach 2 Beach Fill (cy)	0	\$8.50	369,335	\$3,139,349	
-	- -	\$8.50	199,208		\$1,693,270
Reach 3 Beach Fill (cy)	0	\$9.00	920,780	\$8,287,023	
	-	\$9.00	288,850		\$2,599,646
Beach Tilling (ac)		\$300	29.9	\$8,966	\$8,966
Hard Bottom Mitigation (ac)		\$300,000	13.2	\$3,949,445	
Subtotal				\$16,484,784	\$5,401,883
Contingency		15%		\$2,472,718	\$810,282
Subtotal Contract Cost				\$18,957,502	\$6,212,165
Geotechnical Investigations		190,000	_	\$190,000	\$190,000
Secure Easements		250,000	_	\$250,000	_
Environmental Monitoring		275,079	_	\$275,079	\$275,079
E&D+S&A		1,342,000	-	\$1,342,000	\$1,342,000
Total Construction Cost				\$21,014,581	\$8,019,244
	Summary-Inves	Summary-Investment and Annual Costs	Costs		
ltem				Renourishment at Indicated Year 2002	at Indicated Year 2013
Construction Cost				\$21,014,581	\$8,019,244
Interest During Construction				\$106,452	0\$
Total Investment Cost				\$21,121,033	\$8,019,244
Present Worth of Each Construction				\$21,121,033	\$4,170,026
Total Present Worth				\$25,291,059	1,059

Average Annual Cost	\$2,357,768
Interest Rate	6.125%

Estimate of Contract and Construction Costs Segment II 100/25' Added Shoreline Width (ft) Renourishment Interval: 12 yrs Project Life: 18 yrs

Item	Project Year	Unit Cost	Quantity	Renourishment	Renourishment at Indicated Year
	,		,	2002	2014
Mobilization		\$1,100,000	τ-	\$1,100,000	\$1,100,000
Reach 2 Beach Fill (cy)	0	\$8.50	382,583	\$3,251,953	
	12	\$8.50	185,961		\$1,580,667
Reach 3 Beach Fill (cy)	0	\$9.00	939,668	\$8,457,009	
	12	\$9.00	269,962		\$2,429,660
Beach Tilling (ac)		\$300	29.9	\$8,966	\$8,966
Hard Bottom Mitigation (ac)		\$300,000	13.6	\$4,069,829	
Subtotal				\$16,887,757	\$5,119,294
Contingency		15%		\$2,533,164	\$767,894
Subtotal Contract Cost				\$19,420,921	\$5,887,188
Geotechnical Investigations		190,000	-	\$190,000	\$190,000
Secure Easements		250,000	τ-	\$250,000	
Environmental Monitoring		275,079	۲	\$275,079	\$275,079
E&D+S&A		1,342,000	_	\$1,342,000	\$1,342,000
Total Construction Cost				\$21,478,000	\$7,694,267
	Summary-Inves	Summary-Investment and Annual Costs	l Costs		
ltem				Renourishment a 2002	Renourishment at Indicated Year 2002 2014
Construction Cost Interest During Construction				\$21,478,000 \$108,800	\$7,694,267 \$0
Total Investment Cost				\$21,586,800	\$7,694,267
Present Worth of Each Construction				\$21,586,800	\$3,770,117
Total Present Worth				\$25,356,917	6,917

Average Annual Cost	\$2,363,908
Interest Rate	6.125%

Estimate of Contract and Construction Costs
Segment II
100/25' Added Shoreline Width (ft)
Renourishment Interval: 13 yrs
Project Life: 18 yrs

Item	Project Year	Unit Cost	Quantity	Renourishment	Renourishment at Indicated Year
		1		7007	2015
Mobilization	,	\$1,100,000	~	\$1,100,000	\$1,100,000
Reach 2 Beach Fill (cy)	0	\$8.50	395,830	\$3,364,556	
	13	\$8.50	172,713		\$1,468,064
Reach 3 Beach Fill (cy)	0	\$9.00	958,555	\$8,626,995	
	13	\$9.00	251,075		\$2,259,674
Beach Tilling (ac)		\$300	29.9	\$8,966	\$8,966
Hard Bottom Mitigation (ac)		\$300,000	14.0	\$4,190,213	
Subtotal				\$17,290,731	\$4,836,704
Contingency		15%		\$2,593,610	\$725,506
Subtotal Contract Cost				\$19,884,340	\$5,562,210
Geotechnical Investigations		190,000	_	\$190,000	\$190,000
Secure Easements		250,000	-	\$250,000	
Environmental Monitoring		275,079	_	\$275,079	\$275,079
E&D+S&A		1,342,000	-	\$1,342,000	\$1,342,000
Total Construction Cost				\$21,941,419	\$7,369,289
	Summary-Inves	Summary-Investment and Annual Costs	Costs		
ltem				Renourishment a 2002	Renourishment at Indicated Year 2002
Construction Cost				\$21,941,419	\$7,369,289
Interest During Construction				\$111,147	\$0
Total Investment Cost				\$22,052,566	\$7,369,289
Present Worth of Each Construction				\$22,052,566	\$3,402,479
Total Present Worth				\$25,45	\$25,455,045

Average Annual Cost	\$2,373,056
Interest Rate	6.125%

Estimate of Contract and Construction Costs Segment II 100/25' Added Shoreline Width (ft) Renourishment Interval: 14 yrs Project Life: 18 yrs

ltem	Project Year	Unit Cost	Quantity	Renourishment a	Renourishment at Indicated Year 2002
Mobilization		\$1,100,000		\$1,100,000	\$1,100,000
Reach 2 Beach Fill (cy)	0	\$8.50	409,078	\$3,477,159	
	4	\$8.50	159,466		\$1,355,461
Reach 3 Beach Fill (cy)	0	\$9.00	977,442	\$8,796,982	-
	14	\$9.00	232,188		\$2,089,688
Beach Tilling (ac)		\$300	29.9	\$8,966	\$8,966
Hard Bottom Mitigation (ac)		\$300,000	14.4	\$4,310,597	
Subtotal				\$17,693,704	\$4,554,115
Contingency		15%		\$2,654,056	\$683,117
Subtotal Contract Cost				\$20,347,759	\$5,237,232
 Geotechnical Investigations		190,000	~	\$190,000	\$190,000
Secure Easements		250,000	.	\$250,000	
Environmental Monitoring		275,079	-	\$275,079	\$275,079
E&D+S&A		1,342,000	1	\$1,342,000	\$1,342,000
Total Construction Cost				\$22,404,838	\$7,044,311
	Summary-Inves	Summary-Investment and Annual Costs	l Costs		
l te m				Renourishment a	Renourishment at Indicated Year 2002
Construction Cost Interest During Construction				\$22,404,838 \$113,495	\$7,044,311 \$0
Total Investment Cost				\$22,518,333	\$7,044,311
Present Worth of Each Construction	•			\$22,518,333	\$3,064,719
Total Present Worth				\$25,58	\$25,583,052

Average Annual Cost	\$2,384,989
Interest Rate	6.125%

Estimate of Contract and Construction Costs
Segment II
100/25' Added Shoreline Width (ft)
Renourishment Interval: 15 yrs
Project Life: 18 yrs

ltem	Project Year	Unit Cost	Quantity	Renourishment at Indicated Year 2002	at Indicated Year 2017
Mobilization		\$1,100,000		\$1,100,000	\$1,100,000
Reach 2 Beach Fill (cy)	0	\$8.50	422,325	\$3,589,762	
	15	\$8.50	146,219		\$1,242,857
Reach 3 Beach Fili (cy)	0	\$9.00	996,330	\$8,966,968	
	15	\$9.00	213,300		\$1,919,702
Beach Tilling (ac)		\$300	29.9	\$8,966	\$8,966
Hard Bottom Mitigation (ac)		\$300,000	14.8	\$4,430,981	
Subtotal				\$18,096,677	\$4,271,526
Contingency		15%		\$2,714,502	\$640,729
Subtotal Contract Cost				\$20,811,178	\$4,912,254
Geotechnical Investigations		190,000	<u>_</u>	\$190,000	\$190,000
Secure Easements		250,000	_	\$250,000	
Environmental Monitoring		275,079	_	\$275,079	\$275,079
E&D+S&A		1,342,000	-	\$1,342,000	\$1,342,000
Total Construction Cost				\$22,868,257	\$6,719,333
	Summary-Inves	Summary-Investment and Annual Costs	Costs		
ltem				Renourishment a 2002	Renourishment at Indicated Year 2002
Construction Cost				\$22,868,257	\$6,719,333
Interest During Construction				\$115,842	\$0
Total Investment Cost				\$22,984,100	\$6,719,333
Present Worth of Each Construction				\$22,984,100	\$2,754,613
Total Present Worth				\$25,73	\$25,738,713

Average Annual Cost	\$2,399,501
Interest Rate	6.125%

Implementation of the Reevaluated Federal Project Interval Optimization Summary

Pompano Beach to Lauderdale-by-the-Sea

Nourishment Interval (years)	Project Costs
9	\$967,000
10	\$967,000
11	\$969,000
12	\$972,000
13	\$976,000
14	\$981,000
15	\$988,000

Estimate of Contract and Construction Costs Pompano Beach to Lauderdale-by-the-Sea 100' Added Shoreline Width (ft) Renourishment Interval: 9 yrs Project Life: 18 yrs

ltem	Project Year	Unit Cost	Quantity	Renourishment 2002	Renourishment at Indicated Year 2002
Mobilization Reach 2 Beach Fill (cy)	0	\$1,000,000 \$8.50	1 342,840	\$1,000,000 \$2,914,143	\$1,000,000
	o .	\$8.50	225,703		\$1,918,477
Beach Tilling (ac)		\$300	17.8	\$5,331	\$5,331
Hard Bottom Mitigation (ac)		\$300,000	6.1	\$1,843,153	
Subtotal				\$5,762,627	\$2,923,808
Contingency		15%		\$864,394	\$438,571
Subtotal Contract Cost				\$6,627,021	\$3,362,379
Geotecnnical Investigations		107,203	-	\$107,203	\$107,203
Secure Easements		125,000	<u></u>	\$125,000	-
Environmental Monitoring		155,207	_	\$155,207	\$155,207
E&D+S&A.		757,193	1	\$757,193	\$757,193
Total Construction Cost				\$7,771,624	\$4,381,982
	Summary-Inves	Summary-Investment and Annual Costs	l Costs		
ltem				Renourishment 2002	Renourishment at Indicated Year 2002
Construction Cost				\$7,771,624	\$4,381,982
Interest During Construction				\$38,787	\$0
Total Investment Cost				\$7,810,411	\$4,381,982
Present Worth of Each Construction				\$7,810,411	\$2,566,323
Total Present Worth				\$10,3	\$10,376,734

Average Annual Cost	\$967,375
Interest Rate	6.125%.

Estimate of Contract and Construction Costs
Pompano Beach to Lauderdale-by-the-Sea
100' Added Shoreline Width (ft)
Renourishment Interval: 10 yrs
Project Life: 18 yrs

ltem	Project Year	Unit Cost	Quantity	Renourishment 2002	Renourishment at Indicated Year 2002
Mobilization Reach 2 Beach Fill (cv)	0	\$1,000,000	1 356.088	\$1,000,000 \$3,026,746	\$1,000,000
	, 0	\$8.50	212,456		\$1,805,873
Beach Tilling (ac)		\$300	17.8	\$5,331	\$5,331
Hard Bottom Mitigation (ac)		\$300,000	6.4	\$1,919,653	
Subtotal				\$5,951,730	\$2,811,205
Contingency		15%		\$892,760	\$421,681
Subtotal Contract Cost				\$6,844,490	\$3,232,885
Geotechnical Investigations		107.203	•	\$107.203	\$107.203
Secure Easements		125,000	_	\$125,000	•
Environmental Monitoring		155,207	<u>-</u>	\$155,207	\$155,207
E&D+S&A		757,193	~	\$757,193	\$757,193
Total Construction Cost				\$7,989,093	\$4,252,488
	Summary-Inves	Summary-Investment and Annual Costs	al Costs		
motl				Renourishment	Renourishment at Indicated Year
				2002	2012
Construction Cost				\$7,989,093	\$4,252,488
Interest During Construction				\$39,873	\$0
Total Investment Cost				\$8,028,965	\$4,252,488
Present Worth of Each Construction				\$8,028,965	\$2,346,746
Total Present Worth				\$10,3	\$10,375,711

1
6.125%

Estimate of Contract and Construction Costs Pompano Beach to Lauderdale-by-the-Sea 100' Added Shoreline Width (ft) Renourishment Interval: 11 yrs Project Life: 18 yrs

Item	Project Year	Unit Cost	Quantity	Renourishment 2002	Renourishment at Indicated Year 2002
Mobilization Reach 2 Beach Fill (cy)	0	\$1,000,000 \$8.50	1 369,335	\$1,000,000 \$3,139,349	\$1,000,000
	11	\$8.50	199,208	·	\$1,693,270
Beach Tilling (ac)		\$300	17.8	\$5,331	\$5,331
Hard Bottom Mitigation (ac)		\$300,000	6.7	\$1,996,153	
Subtotal				\$6,140,833	\$2,698,602
Contingency		15%		\$921,125	\$404,790
Subtotal Contract Cost				\$7,061,958	\$3,103,392
Geotechnical Investigations		107,203	-	\$107,203	\$107,203
Secure Easements		125,000	_	\$125,000	
Environmental Monitoring		155,207	—	\$155,207	\$155,207
E&D+S&A		757,193	1	\$757,193	\$757,193
Total Construction Cost				\$8,206,561	\$4,122,995
	Summary-Inves	Summary-Investment and Annual Costs	ıl Costs		
tem				Renourishment	Renourishment at Indicated Year
				2002	2013
Construction Cost				\$8,206,561	\$4,122,995
Interest During Construction				\$40,958	Ş.
Total Investment Cost				\$8,247,519	\$4,122,995
Present Worth of Each Construction				\$8,247,519	\$2,143,967
Total Present Worth				\$10,38	\$10,391,486

Average Annual Cost	\$968,750
Interest Rate	6.125%

Estimate of Contract and Construction Costs Pompano Beach to Lauderdale-by-the-Sea 100' Added Shoreline Width (ft) Renourishment Interval: 12 yrs Project Life: 18 yrs

Item	Project Year	Unit Cost	Quantity	Renourishment a	Renourishment at Indicated Year 2002
Mobilization Reach 2 Beach Fill (cy)	0	\$1,000,000 \$8.50	1 382,583	\$1,000,000 \$3,251,953	\$1,000,000
<u>.</u>	12	\$8.50	185,961		\$1,580,667
Beach Tilling (ac)		\$300	17.8	\$5,331	\$5,331
Hard Bottom Mitigation (ac)		\$300,000	6.9	\$2,072,653	
Subtotal				\$6,329,936	\$2,585,998
Contingency		15%		\$949,490	\$387,900
Subtotal Contract Cost				\$7,279,427	\$2,973,898
Geotechnical Investigations		107,203	, —	\$107,203	\$107,203
Secure Easements		125,000	_	\$125,000	
Environmental Monitoring		155,207	~	\$155,207	\$155,207
E&D+S&A		757,193	7	\$757,193	\$757,193
Total Construction Cost				\$8,424,030	\$3,993,501
	Summary-Inves	Summary-Investment and Annual Costs	ıl Costs		
Item				Renourishment	Renourishment at Indicated Year
				2002	20:14
Construction Cost				\$8,424,030	\$3,993,501
Interest During Construction				\$42,044	\$0
Total Investment Cost				\$8,466,073	\$3,993,501
Present Worth of Each Construction				\$8,466,073	\$1,956,777
Total Present Worth				\$10,422,851	22,851

Average Annual Cost	\$971,674
Interest Rate	6.125%

Estimate of Contract and Construction Costs
Pompano Beach to Lauderdale-by-the-Sea
100' Added Shoreline Width (ft)
Renourishment Interval: 13 yrs
Project Life: 18 yrs

ltem	Project Year	Unit Cost	Quantity	Renourishment 2002	Renourishment at Indicated Year 2002
Mobilization Reach 2 Reach Fill (cv)	c	\$1,000,000	1	\$1,000,000	\$1,000,000
	13	\$8.50	172,713	50,00	\$1,468,064
Beach Tilling (ac)		\$300	17.8	\$5,331	\$5,331
Hard Bottom Mitigation (ac)		\$300,000	7.2	\$2,149,153	
Subtotal				\$6,519,040	\$2,473,395
Contingency		15%		\$977,856	\$371,009
Subtotal Contract Cost				\$7,496,896	\$2,844,404
Geotechnical Investigations		107,203	-	\$107,203	\$107,203
Secure Easements		125,000	_	\$125,000	
Environmental Monitoring		155,207	_	\$155,207	\$155,207
E&D+S&A		757,193	1	\$757,193	\$757,193
Total Construction Cost				\$8,641,499	\$3,864,007
	Summary-Inves	Summary-Investment and Annual Costs	l Costs		
ltem				Renourishment 2002	Renourishment at Indicated Year 2002
Construction Cost				\$8,641,499	\$3,864,007
Interest During Construction				\$43,129	\$0
Total Investment Cost				\$8,684,627	\$3,864,007
Present Worth of Each Construction				\$8,684,627	\$1,784,053
Total Present Worth				\$10,4	\$10,468,681

Interest Rate 6.125%	Average Annual Cost	\$975,946
	Interest Rate	6.125%

Estimate of Contract and Construction Costs
Pompano Beach to Lauderdale-by-the-Sea
100' Added Shoreline Width (ft)
Renourishment Interval: 14 yrs
Project Life: 18 yrs

ltem	Project Year	Unit Cost	Quantity	Renourishment 2002	Renourishment at Indicated Year 2002
Mobilization Reach 2 Beach Fill (cv)	0	\$1,000,000 \$8.50	1 409,078	\$1,000,000 \$3,477,159	\$1,000,000
	4	\$8.50	159,466		\$1,355,461
(ar) Tillit door		0089	47.8	85 324	¢5 334
Beach Filming (ac) Hard Bottom Mitigation (ac)		\$300,000	J. 7.	\$2,225,653	
Subtotal				\$6,708,143	\$2,360,792
Contingency		15%		\$1,006,221	\$354,119
Subtotal Contract Cost				\$7,714,364	\$2,714,911
Geotecnnical Investigations		107,203	Ŀ	\$107,203	\$107,203
Secure Easements		125,000	_	\$125,000	
Environmental Monitoring		155,207	_	\$155,207	\$155,207
E&D+S&A		757,193	1	\$757,193	\$757,193
Total Construction Cost				296'858'8\$	\$3,734,514
	Summary-Inves	Summary-Investment and Annual Costs	Costs		
Item				Renourishment	Renourishment at Indicated Year
				2002	20102
Construction Cost				\$8,858,967	\$3,734,514
Interest During Construction		<u>.</u>		\$44,214) }
Total Investment Cost				\$8,903,182	\$3,734,514
Present Worth of Each Construction				\$8,903,182	\$1,624,749
Total Present Worth				\$10,5	\$10,527,930

\$981,470	6.125%	
Average Annual Cost	Interest Rate	

Estimate of Contract and Construction Costs Pompano Beach to Lauderdale-by-the-Sea 100' Added Shoreline Width (ft) Renourishment Interval: 15 yrs Project Life: 18 yrs

Item	Project Year	Unit Cost	Quantity	Renourishment a	Renourishment at Indicated Year 2002
Mobilization Reach 2 Beach Fill (cy)	0	\$1,000,000 \$8.50	1 422,325	\$1,000,000 \$3,589,762	\$1,000,000
	15	\$8.50	146,219		\$1,242,857
Beach Tilling (ac)		\$300	17.8	\$5,331	\$5,331
Hard Bottom Mitigation (ac)		\$300,000	7.7	\$2,302,152	:
Subtotal				\$6,897,246	\$2,248,189
Contingency		15%		\$1,034,587	\$337,228
Subtotal Contract Cost				\$7,931,833	\$2,585,417
Geotecnnical Investigations		107,203	į,	\$107,203	\$107,203
Secure Easements		125,000	-	\$125,000	
Environmental Monitoring		155,207	-	\$155,207	\$155,207
E&D+S&A		757,193	1	\$757,193	\$757,193
Total Construction Cost				\$9,076,436	\$3,605,020
	Summary-Inves	Summary-Investment and Annual Costs	l Costs		
tem.				Renourishment	Renourishment at Indicated Year
				2002	2017
Construction Cost				\$9,076,436	\$3,605,020
Interest During Construction	٠			\$45,300	<u>Q</u>
Total Investment Cost				\$9,121,736	\$3,605,020
Present Worth of Each Construction				\$9,121,736	\$1,477,890
Total Present Worth				\$10,59	\$10,599,626

6.125%	Interest Rate
\$988,154	Average Annual Cost